

Performance Report on Surface Streets in the Seattle Central Business District

Volume 4: Third Update - Post Tunnel Closure August 10, 2006



As required by the Agreement between King County, City of Seattle and Sound Transit, as revised June 24, 2002, for the Downtown Seattle Transit Tunnel and Related Facilities.

Prepared by the Monitor and Maintain Committee, with representation from the following agencies:



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Report Purpose

This report, and subsequent updates, are intended to provide the documentation necessary to satisfy the requirements of Section 10.3 of the “Agreement Regarding the Design, Construction and Operation of the Downtown Seattle Transit Tunnel and Related Facilities”, as executed by the City of Seattle, King County and Sound Transit.

Excerpts from Section 10.3 of this Agreement read as follows:

“It is the Parties’ intent that the Downtown Seattle Traffic and Street Improvements will be sufficient to maintain bus service performance on surface streets in downtown Seattle, during the closure period and after the tunnel is re-opened at performance levels similar to those existing prior to the Closure Period. The Parties hereby establish a Monitor and Maintain Committee (M&M Committee) to be comprised of the designated contacts set forth in Section 20.0. The M&M Committee may be expanded to include participation by other public agencies at the discretion of the Parties. The M&M Committee shall conduct baseline studies of bus travel time and passenger convenience, security, safety and comfort during a measurement period prior to the Closure Period (Baseline Measurement Period.)”

“During the Closure Period and for one year after the Tunnel is reopened, the M&M Committee shall continue to monitor downtown Seattle transportation system performance and make recommendations to the Parties to take actions to maintain said system performance. In performing its functions, the Committee shall be directed to (a) consult with and seek input from suburban stakeholders and (b) report quarterly to the City Council’s Transportation Committee regarding the performance of the downtown transportation system and regarding the Committee’s consultation with various stakeholders.”

The M&M Committee issued its first performance report in September, 2005 just prior to tunnel closure. Volume 1 of the report documented pre-tunnel closure conditions for six specific performance measures. Data for this initial baseline report was collected during the spring and summer of 2005. The six performance measures that are being tracked are as follows:

- Transit travel time
- General purpose traffic operations
- Transit ridership and bus volumes
- Pedestrian activity at bus zones
- Seattle Central Business District (CBD) Customer Surveys
- Transportation Demand Management (TDM) mitigation programs

Each of these six performance studies has been funded as a project within the overall Tunnel Agreement.

Volume 2 of the report was issued January, 2006. It provided the initial assessment of how the tunnel closure plan performed overall, and provided a detailed summary of the contingency planning effort that took place in the first 90 days following tunnel closure. The data sets used for Volume 2 were collected in the fall of 2005, following tunnel closure and extended up to the beginning of the Thanksgiving holidays. This allowed for a better comparison of before and after tunnel closure conditions in the Seattle central business district for non-holiday times.

Volume 3 of this report – issued March 2006 - provided updates on a subset of the six performance measures. Specifically, Volume 3 provided updated information on Measures 1, 3 and 4 and summarized the effect of a set of measures implemented after the release of Volume 2 to address issues identified after tunnel closure. These measures are: transit travel time; transit ridership and bus volumes; and pedestrian activity at bus zones. For Volume 3, transit travel time and bus volumes were derived from the first two weeks in February following the spring 2006 service change. Transit ridership figures are

derived from the fall 2005 service change that ended on February 11, 2006. Pedestrian activity at bus stops is derived from a survey taken in late February/early March.

This Volume 4 report provides updated information on five of the six performance measures.

The projected schedule for the release of the balance of the report updates has been updated, as shown in Figure 1. There will now be a total of seven, rather than eight reports issued as part of this monitoring program. It has been determined that an eight report scheduled for release in March 2008 will not be needed. With the release of Volume 4, there are now only three reports yet to be released.

Figure 1. Performance Report Release Dates

Performance Measure Updates	Performance Report Release Dates						
	Complete	Complete	Complete	Complete	Dec 06	June 07	Dec 07
	Sept 05	Jan 06	March 06r	Aug 06			
	Volume 1	Volume 2	Volume 3	Volume 4			
Transit Travel Time	⊙	⊙	⊙	⊙	⊙	⊙	⊙
General Purpose Traffic Operations	⊙	⊙		⊙		⊙	⊙
Transit Ridership and Bus Volumes	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Pedestrian Activity at Bus Zones	⊙	⊙	⊙				⊙
Surveys of CBD customers	⊙			⊙	⊙		⊙
TDM mitigation programs	⊙	⊙		⊙	⊙	⊙	⊙

It is the intent of the M&M Committee to use these reports as a means of communicating on a regular basis the actions taken by the M&M Committee to address any deficiencies in the performance of the CBD transportation system during tunnel closure. In December 2006 the M&M Committee will issue Volume 5, the fifth installment of this report.

Executive Summary on Post Tunnel Closure Conditions through July 2006

Volume 4 of this Report summarizes the post tunnel closure experience in the Seattle Central Business District through July 2007.

The balance of this report provides more detail on each of the evaluation programs that compose the third reporting period post tunnel closure. Key highlights from each monitoring program are as follows:

Transit Travel Time & Reliability

The first level of analysis for downtown transit travel time is a composite measurement of average time spent in the study area. This value is obtained by identifying the first and last observation of a bus trip in the CBD, regardless of the corridor. Averaging this figure for all trips results in a single value of time spent in the CBD for all observed trips. This value is used as an index, not a measure. This figure includes layover time as well as through-routed trips under one measurement. It will also include many different paths through the CBD with different lengths and travel conditions. The measure becomes meaningful when compared to the same measurement to the same measure for future conditions to compare the ease of travel for transit through the CBD.

The data used for this reporting period covers the first seven weeks of the June 2006 service change. The Travel Time index for this reporting period is **77**, based on an average travel time of 16:55, and is relatively unchanged from the February 2006 index of 78. The baseline Travel Time Index is **100**, representing the value before tunnel closure. The average travel time value at that time was determined to be 21:59, based on bus trips between 4 - 6 pm on weekdays during the month of July, 2005. The current index represents a **23%** decrease in time spent in the downtown core over the baseline. The consistency between the February 2006 measurements reported in Volume 3 and this analysis period confirm that CBD transit travel times have been largely consistent and the contingency measures implemented following tunnel closure to deal with specific problem areas, such as Stewart, continue to be effective.

At the corridor level, travel time comparisons were made using baseline data collected before tunnel closure and the three set of post tunnel data available through Volumes 2, Volume 3 and now Volume 4. The most recent data sample was taken for the first seven week of the June 2006 service change. The results are summarized below:

- Travel time on First Avenue has degraded from the previous report. This increase is probably attributable to the impact of baseball traffic on Pioneer Square during this data collection period.
- The average travel time on Second Avenue improved by about one minute in the morning peak and by about two minutes in the evening peak, from the previous report with no effective change in variation.
- For Third Avenue, average travel times improved by about one minute in the northbound direction and slowed in the southbound direction by about one minute compared to the previous report. Trip variation was comparable for both directions. Travel continues to be better in both directions than before tunnel closure.
- For Fourth Avenue S, southbound between Third Avenue S and S Washington Street to Fourth Avenue S and Royal Brougham, average travel times decreased by one minute during the morning peak, with effectively no change in variation for either the morning or evening peak.
- Travel on Virginia, Stewart, and Howell Streets generally increased over the results reported in Volume 3, suggesting that these corridors all experienced several high congestion incidents during the measurement period. However, Virginia and Stewart still operate better than before tunnel closure. Morning peak on Howell remains slower than before tunnel closure while evening peak is comparable to before tunnel closure.

General Purpose Traffic Operations

Overall, travel times for general purpose traffic did not change significantly for the morning rush hour or for the midday period. Most of the changes were +/- 1 minute of the pre-tunnel closure times. However, travel in the evening rush hour is slower on several key corridors. Stewart Street and Fifth Avenue have been impacted the most, where trip times have increased by 2:31 and 1:45 minutes, respectively. In the most recent data (May 2006), the travel times for these segments have begun to normalize and are less than a minute slower than pre-tunnel closure conditions. In the most recent data suggests that southbound First Avenue and eastbound Cherry Street have increased travel times, with 1:53 and 1:41 minutes longer during the PM peak period than what was measured during the pre-tunnel closure conditions.

As expected, traffic volumes continue to be significantly reduced on Third Avenue and increased on other streets in the central business district due to the traffic restrictions on Third Avenue. The greatest traffic increases occurred on southbound Second Avenue south of Pine Street and on northbound Sixth Avenue south of Olive Street.

It is acknowledged that the downtown transportation system is now more fragile and more subject to periodic disruption due to various types of incidents, such as accidents, inclement weather, on-street parking violations, vehicle breakdowns and special events. There is very little reserve capacity left to deal with these situations. As a result, it takes less to trigger a traffic problem and longer for the system to recover from it.

Transit Ridership and Bus Volumes

Approximately 95,000 north-south riders crossed the downtown screenline at University Street on weekdays in fall 2004 prior to tunnel closure. As part of a general increase in ridership, this number increased to almost 106,700 weekday riders in spring 2005. For spring 2006, downtown loads crossing University Street decreased slightly from the spring 2005 level, to 103,000.

The bus volumes on surface streets in the Seattle Central Business District have not changed significantly from those reported in Volume 3. They continued to reflect the routing adjustments made post tunnel closure to address operation problems on Stewart Street.

Customer Surveys

A small intercept survey of approximately 200-300 downtown users was conducted in the fall of 2005 immediately following tunnel closure. A second intercept survey was conducted in the spring 2006. The results of these intercept survey can not be compared with the results of the much larger baseline and statistically significant survey conducted prior to tunnel closure. But the smaller intercept surveys do provide inferences that are comparable to what can be derived from focus groups.

Results from the spring 2006 quick feedback survey were generally consistent with results from fall 2005. The majority of respondents who participated in the 2006 survey felt it was not more difficult to get to downtown, that their buses were on time and that the convenience of their bus stop locations has not changed. However, a sizable minority of respondents still feel these travel elements had gotten worse since the tunnel closed. Respondents were evenly divided on whether it now takes more time to get through downtown and whether downtown is more crowded than before the tunnel closure.

Transportation Demand Management Program

The package of Transportation Demand Management (TDM) programs introduced in support of tunnel closure has successfully expanded participation in commute options. As of this report, results through May, 2006 are as follows:

- Over 500 Puget Pass holders have signed up for the Home Free Guarantee (HFG) for Individuals program.

- Registration activity at Rideshare Online has increased with more than 930 registrations by downtown employees since the Downtown Seattle Transit Tunnel closure.
- The number of merchants participating in the second edition of the Shop, Dine & Ride book increased to 120.
- 54 bike riders have completed the full three-hour bicycle commute skills workshop offered by the Cascade Bicycle Club in the second reporting period.

Measure 1: Transit Travel Time

Monitoring Objectives

The purpose of monitoring transit travel times is to answer the following questions regarding transit travel times in the Seattle downtown core before and after tunnel closure:

- How long are the transit travel times in the Seattle downtown core?
- How consistent are the transit travel times in the Seattle downtown core?
- Where are slowdowns occurring and are there mitigation measures that might address these slowdowns?

Methodology

Transit travel times on surface streets were measured using roadside bus detection equipment at 16 locations in the Seattle downtown core. The locations of these detection points are identified in Figure 2. A description of the equipment and technology can be found in the Methodology section of the baseline tunnel closure report.

The collection of transit travel times began in summer 2005 and will be continuously collected throughout the tunnel closure period. Two levels of data are included in the regular performance reports issued by the Monitor and Maintain Committee:

Level 1: Seattle downtown core summary statistics will be the highest level summary. They consist of aggregated travel times through the study area to define an average transit operating time in the Seattle downtown core on surface streets for the AM peak and the PM peak. This measure will show the amount of time a bus takes on average to traverse the downtown area. Considered over time, this measure will give an overall trend of the increase or decrease in delay on surface streets caused by tunnel closure.

Level 2: Transit Corridor Travel Time summary will track travel time along a discrete set of transit corridors on surface streets in the central business district. The transit corridors included in the monitoring are identified in Figure 2. The data will be categorized by corridor and by time of day (AM Peak and PM Peak). Variability of the data will also be reported to show the consistency of transit travel times.

Figure 2. Transit Travel Time Summary Analysis Corridors and Detection Point Locations



Transit Travel Time Comparison

Data for transit travel time in the Seattle downtown core post tunnel closure is collected continuously. For this report, weekday travel times between June 5, 2006 and July 21, 2006 were used. This period was used to coincide with the summer 2006 service change that went into effect Saturday, June 3rd. Time of day periods, monitoring locations and analysis tiers, as described in the previous section, are the same as the baseline report except where noted.

In general, transit travel time averages on surface streets for this period were faster than the initial post-closure period results, and relatively unchanged from the previous report. Most corridor travel times improved or slowed slightly with a change in average travel time of less than one minute. The exception was First Avenue, which showed notable slowing, probably due to the impacts of Pioneer Square congestion. Overall, DSTT closure mitigation measures are benefiting CBD transit.

Seattle downtown core Travel Time Summary (Level 1):

The first level of analysis for downtown transit travel time is a composite measurement of average time spent in the study area. This value is obtained by identifying the first and last observation of a bus trip in the downtown core, regardless of the corridor. Averaging this figure for all trips results in a single value of time spent in the downtown core for all observed trips.

This value is used as an index, not a measure. This figure includes layover time as well as through-routed trips under one measurement. It will also include many different paths through the downtown core with different lengths and travel conditions. The measure becomes meaningful when compared to the same measurement in the future to compare the ease of travel for transit through the downtown core.

The baseline Travel Time Index is **100**, representing the value before tunnel closure. The average travel time value at that time was determined to be 21:59, based on bus trips between 4 - 6 pm on weekdays during the month of July, 2005. The data used for this reporting period covers the first seven weeks of the June 2006 service change. The Travel Time index for this reporting period is **77**, based on an average travel time of 16:55, and is relatively unchanged from the February 2006 index of 78, as reported in Volume 3. The current index represents a **23%** decrease in time spent in the downtown core over the baseline. The consistency between the February 2006 measurements and this analysis period confirm that CBD transit travel times have been consistent following post tunnel closure implementation of a set of contingency measures to deal with specific problem areas, such as Stewart Street. Please refer to Volume 3 of this report for a description of these contingency measures.

Transit Corridor Travel Time Summaries (Level 2)

The four charts in Figure 3 show the average travel times for transit after tunnel closure on selected corridors. The data was collected in June and July 2006 using the monitoring system. The data used is from weekdays only. Each chart shows the average travel time for the direction of travel and time of day indicated. The AM charts include buses observed between 7 – 9 am at the first reader on the corridor being measured. The PM charts cover the time period from 4 – 6 pm.

The average corridor travel times in this report are compared to the comparable statistics for both pre-tunnel closure baseline conditions and for the tunnel closure data reported in successive reports. Corridor travel times should not be compared to each other. Readers were placed to ensure route coverage. Readers were also sited to facilitate communications and insure access to power. As a result, the measured corridors differ in length, number of stops and number of signals, all of which affect travel time but are not related to congestion.

The reader locations that define the boundaries of each of the transit corridors are described below along with a table for each corridor that summarizes the Average Travel Time by time period along with the standard deviation (SD) of the observations in minutes. As a statistical measure, approximately 69% of all observations are within one standard deviation of the average. The SD can be interpreted as

approximating the range (+/- SD) of the typical travel time that a majority of bus riders will experience on the corridor. There are currently four data points; pre-tunnel baseline, and Volume 2, 3 and 4 post-tunnel closure observations.

Figure 3. Transit Corridor Travel Time after Tunnel Closure, July 2006

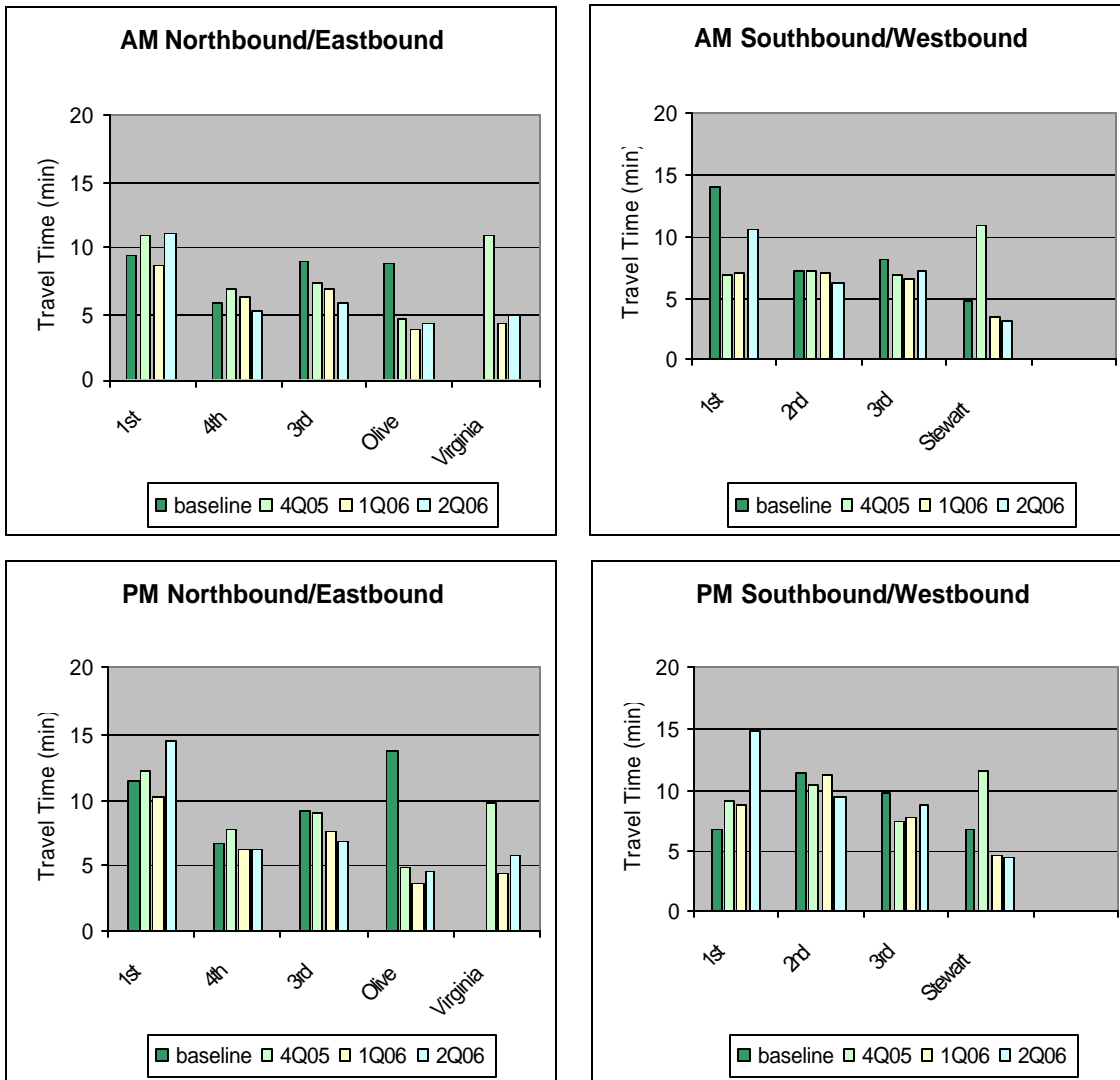


Figure 4A. First Avenue Transit Travel Time and Variation

First Avenue	AM Peak (7 – 9 am)	PM Peak (4 – 6 pm)
Northbound, Royal Brougham to Seneca Street	Travel time: Baseline – 9 min 22 sec (<i>SD: 4.8 min</i>) Volume 2 – 10 min 54 sec (<i>SD: 5.8 min</i>) Volume 3 – 8 min 36 sec (<i>SD: 1.8 min</i>) Volume 4 – 11 min 8 sec (<i>SD: 2.1 min</i>) Change from Volume 3 : +2min 32sec	Travel Time: Baseline – 11 min 24 sec (<i>SD: 5.3 min</i>) Volume 2 – 12 min 12 sec (<i>SD: 6.0 min</i>) Volume 3 – 10 min 18 sec (<i>SD: 3 min</i>) Volume 4 – 14 min 34 sec (<i>SD: 4.3 min</i>) Change from Volume 3 : +4min 16sec
Southbound, Seneca Street to Royal Brougham*	Travel time: Baseline – 14 min (<i>SD: 8.8 min</i>) Volume 2 – 7 min (<i>SD: 5.4 min</i>) Volume 3 – 7 min 8 sec (<i>SD: 1 min</i>) Volume 4 – 10 min 40 sec (<i>SD: 1.8 min</i>) Change from Volume 3 : +3min 32sec	Travel time: Baseline – 6 min 51 sec (<i>SD: 3.9 min</i>) Volume 2 – 9 min 6 sec (<i>SD: 6 min</i>) Volume 3 – 8 min 49 sec (<i>SD: 1.4 min</i>) Volume 4 – 14 min 55 sec (<i>SD: 3 min</i>) Change from Volume 3 : +6min 6sec

First Avenue (Northbound and Southbound) reader locations are Royal Brougham to the south and Stewart Street to the north, with a midpoint at Seneca Street. Average and variation in travel time on First Avenue increased notably. The largest increases were in the PM Peak period, especially in the southbound direction. This increase is most likely due to SR519 project construction, and the impact of baseball traffic on Pioneer Square. The relatively low number of observed trips on this corridor and the high standard deviation may have produced an exaggerated result, but average travel times are definitely longer than the previous period.

Figure 4B. Second Avenue Transit Travel Time and Variation

Second Avenue	AM Peak (7 – 9 am)	PM Peak (4 – 6 pm)
Southbound, Pike Street to S Jackson Street	Travel time: Baseline – 7 min 20 sec (<i>SD: 1.9 min</i>) Volume 2 – 7 min 13 sec (<i>SD: 2.6 min</i>) Volume 3 – 7 min 11 sec (<i>SD: 1.45 min</i>) Volume 4 – 6 min 13 sec (<i>SD: 1.5 min</i>) Change from Volume 3 : -58sec	Travel time: Baseline – 11 min 26 sec (<i>SD: 4.3 min</i>) Volume 2 – 10 min 26 sec (<i>SD: 3.5 min</i>) Volume 3 – 11 min 10 sec (<i>SD: 2.4 min</i>) Volume 4 – 9 min 22 sec (<i>SD: 2.2 min</i>) Change from Volume 3 : -1min 48sec

Second Avenue (Southbound only) reader locations are Pike Street and S Jackson Street with a midpoint at Seneca Street. Second Avenue improved in average travel time with effectively no change in variation. Because this measurement is for the entire length of Second Avenue, it does not capture the sometimes significant delays for transit turning right at Columbia Street to access SR99 southbound.

Figure 4C. Third Avenue Transit Travel Time and Variation

Third Avenue	AM Peak (7 – 9 am)	PM Peak (4 – 6 pm)
Northbound, Yesler Way to Stewart Street	Travel time: Baseline – 9 min (<i>SD: 4.6 min</i>) Volume 2 – 7 min 20 sec (<i>SD: 3.1 min</i>) Volume 3 – 6 min 53 sec (<i>SD: 1.3 min</i>) Volume 4 – 5 min 53 sec (<i>SD: 1.3 min</i>) Change from Volume 3 : -1min	Travel Time: Baseline – 9 min 6 sec (<i>SD: n/a</i>) Volume 2 – 8 min 57 sec (<i>SD: 3.6 min</i>) Volume 3 – 7 min 41 sec (<i>SD: 1.3 min</i>) Volume 4 – 6 min 53 sec (<i>SD: 1.8 min</i>) Change from Volume 3 : -48sec
Southbound, Stewart Street to Yesler Way	Travel time: Baseline – 8 min 5 sec (<i>SD: 1.3 min</i>) Volume 2 – 6 min 52 sec (<i>SD: 2.8 min</i>) Volume 3 – 6 min 36 sec (<i>SD: 1.6 min</i>) Volume 4 – 7 min 17 sec (<i>SD: 1.5 min</i>) Change from Volume 3 : +41sec	Travel time: Baseline – 9 min 45 sec (<i>SD: 2.5 min</i>) Volume 2 – 7 min 27 sec (<i>SD: 2.9 min</i>) Volume 3 – 7 min 51 sec (<i>SD: 1.5 min</i>) Volume 4 – 8 min 46 sec (<i>SD: 1.8 min</i>) Change from Volume 3 : +55sec

Third Avenue (Northbound and Southbound) reader locations are Stewart Street to the north and Yesler Way to the south, with a midpoint at Seneca Street. Average travel times improved in the northbound direction and slowed in the southbound direction compared to the previous report. Variation was similar to the previous period. Travel times and variation in both directions and peak periods are improved over the pre-closure conditions.

Figure 4D. Fourth Avenue Transit Travel Time and Variation

Fourth Avenue	AM Peak (7 – 9 am)	PM Peak (4 – 6 pm)
Northbound, S Jackson Street to Seneca Street	Travel time: Baseline – 5 min 48 sec (<i>SD: 1.2 min</i>) Volume 2 – 6 min 58 sec (<i>SD: 2.8 min</i>) Volume 3 – 6 min 14 sec (<i>SD: 1.35 min</i>) Volume 4 – 5 min 12 sec (<i>SD: 1.2 min</i>) Change from Volume 3 : -1min 2sec	Travel Time: Baseline – 6 min 46 sec (<i>SD: 1.1 min</i>) Volume 2 – 7 min 50 sec (<i>SD: 4 min</i>) Volume 3 – 6 min 15 sec (<i>SD: 2 min</i>) Volume 4 – 6 min 11 sec (<i>SD: 2.2 min</i>) Change from Volume 3 : -4sec

Fourth Avenue (Northbound only) reader locations are Seneca Street to the north and S Jackson Street to the south. Average travel times decreased by one minute during the morning peak period, with effectively no change in variation for either the morning or evening peak. Average travel times are a half minute below the pre-closure baseline with similar variation.

Figure 4E. Virginia, Olive Way and Howell Transit Travel Time and Variation

	AM Peak (7 – 9 am)	PM Peak (4 – 6 pm)
Eastbound Virginia, Third Avenue to Ninth Ave	Travel time: Volume 2 – 10 min 39 sec (<i>SD: 5.1 min</i>) Volume 3 – 4 min 23 sec (<i>SD: .9 min</i>) Volume 4 – 4 min 53 sec (<i>SD: .9 min</i>) Change from Volume 3 : +30sec	Travel Time: Volume 2 – 9 min 50 sec (<i>SD: 4.9 min</i>) Volume 3 – 4 min 28 sec (<i>SD: 1 min</i>) Volume 4 – 5 min 48 sec (<i>SD: 2.4 min</i>) Change from Volume 3 : +1min 20sec
Eastbound Olive Way, Third Avenue to Eighth Ave	Travel time: Baseline – 8 min 42 sec (<i>SD: 9.1 min</i>) Volume 2 – 4 min 34 sec (<i>SD: 2.4 min</i>) Volume 3 – 3 min 54 sec (<i>SD: 1 min</i>) Volume 4 – 4 min 19 sec (<i>SD: 1 min</i>) Change from Volume 3 : +25sec	Travel Time: Baseline – 13 min 43 sec (<i>SD: 9.7 min</i>) Volume 2 – 4 min 51 sec (<i>SD: 2.5 min</i>) Volume 3 – 3 min 41 sec (<i>SD: .9 min</i>) Volume 4 – 4 min 34 sec (<i>SD: 1.45 min</i>) Change from Volume 3 : +53sec
Eastbound Howell, Eighth Ave to Yale Street	Travel time: Baseline – 2 min 6 sec (<i>SD: 1.4 min</i>) Volume 2 – 3 min 53 sec (<i>SD: 2.4 min</i>) Volume 3 – 3 min 23 sec (<i>SD: 1.6 min</i>) Volume 4 – 3 min 3 sec (<i>SD: 1.25 min</i>) Change from Volume 3 : -20sec	Travel Time: Baseline – 5 min 25 sec (<i>SD: 3.1 min</i>) Volume 2 – 5 min 37 sec (<i>SD: 3.3 min</i>) Volume 3 – 4 min 50 sec (<i>SD: 2.3 min</i>) Volume 4 – 5 min 23 sec (<i>SD: 2.5 min</i>) Change from Volume 3 : +33sec

Virginia Street (Eastbound only) reader locations are Third Avenue at Stewart to the west and Ninth Avenue at Stewart to the east. Virginia Street was not a transit routing before the tunnel closure, so there is no baseline data. Average travel times increased by 30 seconds in the AM, and a minute 20 seconds in the PM. AM variation held constant, but the PM variation increased notably suggesting the corridor experienced several high-congestion incidents during the measurement period.

Olive Way (Eastbound only) reader locations are Third Avenue to the west and Eighth Avenue to the east. Average travel times slowed by 25 seconds in the AM, and nearly a minute in the PM on Olive Way between Third and Eighth Avenues. Like Virginia Street, the PM variation increase was significant and indicates several high-congestion incidents occurred during the measurement period.

Howell (Eastbound only): Transit on Howell east of Eighth Avenue improved slightly in the morning, slowed slightly in the evening, with variation staying fairly consistent. While consistent, PM variation is nearly 50% of the average travel time indicating this segment can be a source of significant delay.

Figure 4F. Stewart Street Transit Travel Time and Variation

	AM Peak (7 – 9 am)	PM Peak (4 – 6 pm)
Westbound, Ninth Avenue to Third Avenue	Travel time: Baseline – 4 min 50 sec (<i>SD: 1.9 min</i>) Volume 2 – 10 min 52 sec (<i>SD: 5.2 min</i>) Volume 3 – 3 min 31 sec (<i>SD: 1 min</i>) Volume 4 – 3 min 8 sec (<i>SD: 1.5 min</i>) Change from Volume 3 : -23 sec	Travel Time: Baseline – 6 min 42 sec (<i>SD: 1.5 min</i>) Volume 2 – 11 min 36 sec (<i>SD: 4.9 min</i>) Volume 3 – 4 min 42 sec (<i>SD: 2 min</i>) Volume 4 – 4 min 32 sec (<i>SD: 2.5 min</i>) Change from Volume 3 : -10 sec

Stewart Street (Westbound only) reader locations are Third Avenue to the west and Ninth Avenue to the east. Average travel time was consistent with the improvements seen in the previous report following the implementation of additional mitigation measures. The current average travel times are now one to two minutes faster than the pre-closure baseline. Variation was also consistent with the previous period.

Measure 2: General Purpose Traffic Operations

Monitoring Objectives

The purpose of monitoring general purpose traffic operations is to measure the impacts of tunnel closure on general purpose traffic in the following areas:

- Measure the change in general purpose traffic volumes
- Measure the change in general purpose vehicle travel times
- Review traffic operations trends during the tunnel closure period and make revisions as needed

This report examines the trend in these measures between the before tunnel closure condition, and the periods measured after the tunnel was closed. The measurement periods were January 2005 (before), and October 2005 and May 2006 (after).

Methodology

Three data collection efforts were used to evaluate the effect that tunnel closure has had on CBD traffic operations: tube counts; travel time studies; and turning movement counts. Traffic counts using pneumatic tubes were employed to collect traffic volumes at selected locations throughout the Seattle CBD. These automated counting machines yield hourly and daily directional volumes. Travel time studies were also conducted to quantitatively assess changes in travel time for general traffic on several corridor segments before and after the tunnel closure. These corridors included segments along First Avenue, Second Avenue, Fourth Avenue, Fifth Avenue, Stewart Street, Olive Way, Pike Avenue, Spring Street and Cherry Street. Turning movement counts were also collected at 23 locations. The pre-tunnel closure data was collected in January 2005. The first installment of post tunnel closure data was collected in October, 2005. The most recent post tunnel closure data was collected in May 2006.

Travel time runs were used to estimate changes in general purpose travel time due to the general purpose travel restriction placed on Third Avenue. The “floating car” travel time method was used to collect this data. This method consists of probe cars driven along the routes, where the driver records the time it takes to traverse the route moving within the flow of general traffic. See Figures 3A, 3B, and 3C for a comparison of each of the twelve distinct travel paths, illustrated by time of day.

Tables 1A through 4 provide a comparison of pre- and post-tunnel closure PM peak hour volumes and Average Weekday Daily traffic (AWDT).

Table 6 illustrates vehicle turning movements for the AM peak, midday and PM peak time period for each of the study locations. The figure highlights turning movement volumes that changed by more than 100 vehicles per hour (vph). The underlined volume represents the before condition turning movement count that changed by more than 100 vph, and the highlighted number is the turning movement count measured that has seen a change of 100+- vph during one of the tunnel closure data collection periods. Blue highlight represents volumes decreased and yellow highlight represents that volumes increased.

Summary of Traffic Impacts

With the implementation of the traffic revisions instituted as tunnel closure mitigation, it was anticipated that traffic circulation and travel through town would be impacted. The overall effectiveness of these traffic mitigation strategies implemented to address these concerns could only be proven through actual operating experience.

Based on the first two sets of post tunnel closure traffic statistics, travel in the morning peak and off-peak periods has been mitigated adequately in terms of sustaining pre-tunnel closure travel times in all but a

few cases. During the PM peak period, there are some areas that have experienced increases in travel times. There have also been some changes in travel times between the last issued report (January 2006) and this report (July 2006) which are noted in the attached tables.

Table 1A: General Purpose Travel Time - AM Peak Period (7 – 9 am)

Report Date	Corridor	Observation
Jan '06	SB 4th Ave from Washington St. to Royal Brougham	Travel time increased by almost 1 minute.
July '06		Travel times are 23 seconds longer than pre-tunnel closure condition
Jan '06	Olive from 3rd Avenue to Boren	Travel times improved by over 1:18, a possible result of the signal timing changes and transit lane investment.
July '06		Travel times are 50 seconds faster than pre-tunnel closure condition
Jan '06	Pike Street	Travel time improved by nearly 1 minute.
July '06		Travel times are the same as pre-tunnel conditions
Jan '06	All other segments	During the AM period were less than 1 minute difference, and represent no significant change in operation.
July '06		There are no new variations in AM travel time data that appear to be significant

Table 1B: General Purpose Travel Time - Midday Period (1 – 3 pm)

Report Date	Corridor	Observation
Jan '06	Cherry Street	Travel time increased by 1:40 based on a sample of 6 travel time runs – this will be monitored to see if any action is required. Construction of a high rise in the area may have contributed to these results.
July '06		Travel time is 1:22 longer than the pre-tunnel closure condition
Jan '06	Pike Street	Improved by nearly 1 minute.
July '06		Travel time improvements reported in January are no longer observed. Travel times are 17 seconds faster than pre-tunnel closure conditions
July '06 (new)	2 nd Avenue	2 nd Avenue travel times from Stewart to James are trending longer in May '06 data. Travel times are 48 seconds longer than pre-tunnel closure condition.
July '06 (new)	SB 4 th Avenue S	Travel times are trending faster and are 1:07 better than the pre-tunnel closure condition.
July '06 (new)	Spring Street	Travel times are trending faster and are 52 seconds better than the pre-tunnel closure condition.
Jan '06	All other segments	During the midday period were less than 1 minute difference, and represent no significant change in operation.
July '06		There are no new variations in midday travel time data that appear to be significant

Table 1C: General Purpose Travel Time - PM Peak Period (4 – 6 pm)

Report Date	Corridor	Observation
Jan '06	Stewart Street	Travel times increased the most –from 3:44 (min:sec) to 6:15 for a total of 2:31. This is attributed to the increased volumes of both bus and general purpose traffic on Stewart and to additional turning traffic from Stewart to 2nd Avenue. Several actions have been taken to address this issue. These measures include additional curb use restrictions, transit re-routes, signal timing changes, and the upgrade of signal equipment. This is being closely monitored to determine if additional treatments will be required.
July '06		Travel times have mostly normalized and are 35 seconds longer than the pre-tunnel closure condition
Jan '06	2nd Avenue	Travel time has increased by over 1 minute due to increased congestion between Stewart and Spring Streets.
July '06		Travel times have improved significantly, and more than normalized and are measured as 1:17 faster than the pre-tunnel closure condition
Jan '06	5th Avenue	Travel times increased from 4:46 to 6:28, an additional 1:45 min:sec.
		Travel times have begun to normalized and are 48 seconds longer than the pre-tunnel closure condition
Jan '06	Spring Street	Travel time increased by approximately 1 minute.
July '06		Travel times have normalized and are within a few seconds of the pre-tunnel closure condition
July '06 (new)	SB 1 st Avenue	Travel time has increased significantly by 1:53 from the pre-tunnel closure condition
July '06 (new)	Cherry Street	Travel time has increased significantly by 1:41 from the pre-tunnel closure condition
Jan '06	All other segments	During the PM period were less than 1 minute difference, and represent no significant change in operation.
July '06		There are no new variations in midday travel time data that appear to be significant

Traffic Volumes and Turning Movement Counts

The following tables describe the change in traffic volumes based on the traffic counts recorded during the first two sets of post tunnel closure traffic statistics. The following tables illustrate a ranking of streets with the greatest volume change for both the PM Peak hour and the Average Weekday Daily Traffic (AWDT) from the Pre-tunnel closure condition, based on the Volume 2 Report that was issued in January, 2006.. The right-most column(s) on these tables summarize volume changes on these approaches compared to pre-tunnel condition for the October 2005 and May 2006 data collection effort.

Table 2. PM Peak Period (4-6 pm) Traffic Volumes

Change to PM Peak hour volume as compared to pre-tunnel condition

Location	Direction	Oct 2005	May 2006
2nd Ave north of Pine St	Southbound	increased by 207 vph (+18%)	increased by 175 vph (+15%)
6th Ave south of Olive Way	Northbound	increased by of 199 vph (+19%)	increased by of 56 vph (+5%)
6th Ave south of University St	Northbound	increased by 168 vph (+16%)	increased by 125 vph (+12%)
1st Ave south of Seneca St	Northbound	increased by of 98 vph (+14%)	increased by of 51 vph (+8%)
Stewart St east of 2nd Ave	Westbound	increased by of 97 vph (+16%)	increased by of 26 vph (+4%)
3rd Ave	NB/SB	dropped an average of 65%	dropped an average of 65%

Table 3. AWDT (Average Weekday Daily Traffic) Variations from Pre-Tunnel Closure Conditions

Location	Direction	October 2005	May 2006
3rd Avenue	NB/SB	Reduced daily traffic on average by 21%. Daily volumes dropped on average by 1,130 vehicles per day. The range was between 600 to 2,000 vehicles per day depending on location.	Reduced daily traffic on average by 23%. Daily volumes dropped on average by 1,250 vehicles per day. The range was between 600 to 2,000 vehicles per day depending on location.
2nd Ave north of Pine St	Southbound	Daily volumes increased the most of all locations. The increase was 3,128 vehicles per day (+22% of pre-tunnel AWDT).	Daily volumes increased the most of all locations. The increase was 1,986 vehicles per day (+14% of pre-tunnel AWDT).
Stewart Street east of 2 nd Ave	Westbound	Daily volumes increased by 1,188 vpd, or +17% of pre-tunnel AWDT.	Daily volumes increased by 680 vpd, or +9% of pre-tunnel AWDT.
6th Ave south of Olive Way	Northbound	Increase in daily traffic with up to an additional 2000 daily trips or +16%	Increase in daily traffic with an additional 578 daily trips or +5%
4th Ave between James and Union Streets.	Northbound	Increase of +6% with 1147 additional daily trips	Increase of +1% with 210 additional daily trips

Table 4. Turning Movement Counts

Report Date	Location	Direction	October 2005
Jan '06	4th Avenue	Northbound Thru	Some of the largest increases in turning movement counts were the northbound through movement along 4th Avenue with over 500 vph in the morning near Cherry, and 500 vph northbound in the afternoon near Union. This diversion from 3rd to 4th Avenues was anticipated, and this illustrates the effect of multiple high rise building garages in the between Cherry and Union Streets area.
July '06			4th Avenue continues to experience an increase in traffic. AM peak hour traffic less than reported in January, and is now only 265 vph more than the pre-tunnel closure condition at the intersection with Cherry St..
Jan '06	Stewart and 3rd Avenue	Southbound Right	Experienced an increase of more than 100 vph. An additional 123 vph during the PM peak hour.
July '06			The southbound right turn at this intersection is beginning to normalize to pre-tunnel closure conditions with only an additional 73 vph during the PM peak hour.
Jan '06	Spring and 2nd Avenue	Southbound left turn	Experienced an increase of more than 100 vph. 106 additional turns during the AM peak period.
July '06			157 trips additional turns where measured during the AM peak hour as compared to the pre-tunnel closure conditions.
July '06	Spring and 2nd Avenue	Southbound Thru	An additional 345 vph were measured at this location as compared to the pre-tunnel closure condition. This is an increase from the January '06 report where only an additional 150 vph where measured.
Jan '06	Lenora Street	Westbound	Some traffic appears to be avoiding Stewart and favoring westbound Lenora Street as an alternate route with an additional 97 trips in the AM and 160 trips in the PM peak hours.
July '06			Traffic on Lenora has dropped slightly from what was reported in January '06 with an additional 52 trips in the AM and 102 in the PM peak hours as compared to pre-tunnel closure conditions.
July '06	6th and University	NB Thru	The AM peak hour NB Thru movement was recorded as 358 vph more than pre-tunnel closure conditions.

Table 5 summarizes changes in PM peak hour and Average Weekday traffic counts for selected streets between pre-tunnel closure and October 2005 and between pre-tunnel closure and May 2006.

Table 5. Changes in AWDT and PM Peak Traffic Volumes

LOCATION	DIR FLOW	Jan-05		Oct-05		May-06		% Change Peak Hour Oct_05 to Jan_05	% Change AWDT Oct_05 to Jan_05	% Change Peak Hour Oct_05 to May_06	% Change AWDT Oct_05 to May_06
		PMPK	AWDT	PMPK	AWDT	PMPK	AWDT				
1ST AVE. NW/O CHERRY ST	South	610	6,645	436	6,467	652	6,502	-29%	-3%	7%	-2%
1ST AVE. NW/O SPRING ST	South	797	10,211	790	10,123	814	10,122	-1%	-1%	2%	-1%
2ND AVE. NW/O PIKE ST	South	1,339	16,831	1,232	15,333	1,394	17,536	-8%	-9%	4%	4%
2ND AVE. NW/O PINE ST	South	1,174	14,441	1,381	17,569	1,349	16,427	18%	22%	15%	14%
2ND AVE. NW/O VIRGINIA ST	South	1,038	12,429	990	13,013	753	12,021	-5%	5%	-27%	-3%
3RD AVE. NW/O LENORA ST	South	316	3,749	228	3,131	262	3,421	-28%	-16%	-17%	-9%
3RD AVE. NW/O PINE ST	South	447	4,684	296	3,612	287	3,630	-34%	-23%	-36%	-23%
3RD AVE. NW/O STEWART ST	South	356	4,095	260	3,331	276	3,388	-27%	-19%	-22%	-17%
3RD AVE. NW/O VIRGINIA ST	South	376	4,450	259	3,473	279	3,409	-31%	-22%	-26%	-23%
3RD AVE. SE/O JAMES ST	South	459	4,286	260	3,132	261	3,194	-43%	-27%	-43%	-25%
3RD AVE. SE/O UNION ST	South	478	6,297	358	4,282	335	4,062	-25%	-32%	-30%	-35%
5TH AVE S. N/O S JACKSON ST	South	600	5,626	640	6,497	588	6,387	7%	15%	-2%	14%
5TH AVE S. N/O S MAIN ST	South	561	5,590	572	6,171	583	6,413	2%	10%	4%	15%
5TH AVE S. S/O S WELLS ST	South	611	5,094	583	5,670	554	5,610	-5%	11%	-9%	10%
WESTERN AVE. NW/O YESLER WAY	South	262	2,301	256	2,304	277	2,473	-2%	0%	6%	7%
1ST AVE. SE/O COLUMBIA ST	North	550	7,430	593	7,968	587	8,115	8%	7%	7%	9%
1ST AVE. SE/O SENECA ST	North	677	7,661	775	8,403	728	8,291	14%	10%	8%	8%
3RD AVE. SE/O BLANCHARD ST	North	630	5,358	338	4,091	325	3,984	-46%	-24%	-48%	-26%
3RD AVE. SE/O UNION ST	North	405	4,871	341	4,275	333	4,270	-16%	-12%	-18%	-12%
3RD AVE. SE/O LENORA ST	North	692	6,189	391	4,829	406	5,022	-44%	-22%	-41%	-19%
3RD AVE. SE/O STEWART ST	North	692	6,667	396	5,550	381	5,174	-43%	-17%	-45%	-22%
3RD AVE. SE/O UNION ST	North	515	6,164	359	4,690	355	4,508	-30%	-24%	-31%	-27%
3RD AVE. SE/O VIRGINIA ST	North	655	5,901	335	4,751	337	4,611	-49%	-19%	-49%	-22%
4TH AVE S. S/O S JACKSON ST	North	1,218	13,926	1,041	12,068	1,093	12,379	-15%	-13%	-10%	-11%
4TH AVE. SE/O CHERRY ST	North	1,784	18,833	1,820	19,000	1,718	18,863	2%	1%	-4%	0%
4TH AVE. SE/O JAMES ST	North	1,523	15,698	1,554	16,456	1,461	15,715	2%	5%	-4%	0%
4TH AVE. SE/O UNION ST	North	1,808	19,236	1,900	20,383	1,827	19,446	5%	6%	1%	1%
5TH AVE S. S/O S WELLS ST	North	86	1,144	155	1,814	128	1,590	81%	59%	49%	39%
6TH AVE. SE/O OLIVE WAY	North	1,055	12,618	1,254	14,644	1,111	13,196	19%	16%	5%	5%
6TH AVE. SE/O UNIVERSITY ST	North	1,026	15,102	1,194	16,332	1,151	16,237	16%	8%	12%	8%
WESTERN AVE. SE/O COLUMBIA ST	North	208	1,587	211	1,637	201	1,662	1%	3%	-3%	5%
CHERRY ST. SW/O 3RD AVE	East	548	5,100	547	5,255	728	8,490	0%	3%	33%	66%
JAMES ST. SW/O 3RD AVE	East	313	2,759	363	3,115	360	3,005	16%	13%	15%	9%
SPRING ST. SW/O 3RD AVE	East	747	7,885	721	7,814	587	5,481	-3%	-1%	-21%	-30%
UNIVERSITY ST. SW/O 3RD AVE	East	445	5,626	507	6,508	484	6,369	14%	16%	9%	13%
JAMES ST. NE/O 2ND AVE	West	282	4,049	290	4,002	291	4,055	3%	-1%	3%	0%
LENORA ST. NE/O 2ND AVE	West	440	4,463	404	4,620	419	4,558	-8%	4%	-5%	2%
PINE ST. NE/O 2ND AVE	West	424	5,330	410	5,602	494	6,203	-3%	5%	17%	16%
STEWART ST. NE/O 2ND AVE	West	626	7,191	723	8,379	652	7,871	16%	17%	4%	9%
STEWART ST. NE/O 4TH AVE	West	785	10,869	819	11,756	772	11,302	4%	8%	-2%	4%

AWDT = Average Weekday Traffic count in vehicles per day

PMPK = PM peak hour traffic count in vehicles per hour

Table 6 summarizes traffic count information at selected intersections for the AM Peak, midday and PM peak for the three different data collection efforts, before tunnel closure in January 2005 and after tunnel closure in October 2005 and May 2006.

Table 6. Traffic Turning Movement Volumes between Pre- and Post-Tunnel Closure Conditions

Underlined - pre-tunnel volumes that changed by more than +/-100 vph yellow - volume is 100+ vph greater than pre-tunnel closure conditions blue - volume is 100 - vph lower than pre-tunnel closure conditions not marked - volumes are within 100vph of pre-tunnel closure conditions.

		Date	Time Period	NB Left	NB Thru	NB Right	SB Left	SBT Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
5th Ave	Main St	1/20/05	AM	0	0	0	18	296	13	0	14	18	15	63	0
5th Ave	Main St	1/20/05	MD	0	0	0	22	270	16	0	23	21	12	53	0
5th Ave	Main St	1/20/05	PM	0	0	0	14	530	18	0	35	26	24	60	0
5th Ave	Main St	10/26/05	AM	3	42	4	14	416	30	0	26	28	6	108	3
5th Ave	Main St	10/26/05	MD	1	24	3	20	350	12	0	24	36	10	60	6
5th Ave	Main St	10/26/05	PM	4	55	14	20	473	23	0	43	36	21	114	3
5th Ave	Main St	5/2/06	AM	2	38	0	29	395	22	0	38	25	9	71	2
5th Ave	Main St	5/2/06	MD	0	19	2	17	301	20	0	19	29	11	56	9
5th Ave	Main St	5/2/06	PM	1	45	6	36	516	15	0	50	43	19	119	3
4th (2nd) Ave S	S Jackson St	1/19/05	AM	0	<u>1429</u>	77	0	0	0	52	239	0	0	215	200
4th (2nd) Ave S	S Jackson St	1/19/05	MD	4	<u>579</u>	128	0	0	0	63	226	0	0	234	233
4th (2nd) Ave S	S Jackson St	1/19/05	PM	5	<u>827</u>	130	0	0	0	103	339	0	0	233	308
4th (2nd) Ave S	S Jackson St	10/18/05	AM	0	<u>1247</u>	61	0	0	0	56	218	0	0	238	198
4th (2nd) Ave S	S Jackson St	10/18/05	MD	0	615	90	0	0	0	63	238	0	0	313	242
4th (2nd) Ave S	S Jackson St	10/18/05	PM	0	772	103	0	0	0	101	326	0	0	285	267
4th (2nd) Ave S	S Jackson St	5/2/06	AM	0	1410	56	0	0	0	61	269	0	0	252	162
4th (2nd) Ave S	S Jackson St	5/2/06	MD	0	588	90	0	0	0	50	226	0	0	274	213
4th (2nd) Ave S	S Jackson St	5/2/06	PM	0	<u>975</u>	117	0	0	0	119	383	0	0	256	225
5th Ave S	S Washington	1/19/05	AM	0	0	0	15	307	62	0	20	12	13	49	0
5th Ave S	S Washington	1/19/05	MD	0	0	0	14	270	69	0	16	25	7	33	0
5th Ave S	S Washington	1/19/05	PM	0	0	0	22	476	64	0	16	36	17	58	0
5th Ave S	S Washington	10/27/05	AM	32	0	9	12	354	62	0	7	10	9	24	0
5th Ave S	S Washington	10/27/05	MD	8	0	33	20	342	101	0	15	26	7	38	0
5th Ave S	S Washington	10/27/05	PM	38	0	24	18	471	47	0	26	56	8	31	0
5th Ave S	S Washington	5/2/06	AM	37	0	9	20	389	102	0	24	7	18	40	0
5th Ave S	S Washington	5/2/06	MD	13	0	19	22	329	54	0	26	16	9	41	0
5th Ave S	S Washington	5/2/06	PM	41	0	11	21	464	34	0	65	26	11	52	0
4th Ave	James St	1/20/05	AM	25	1187	58	0	0	0	20	167	0	0	383	315
4th Ave	James St	1/20/05	MD	28	833	126	0	0	0	15	202	0	0	275	254
4th Ave	James St	1/20/05	PM	20	<u>1261</u>	129	0	0	0	30	224	0	0	302	355
4th Ave	James St	10/19/05	AM	46	1346	72	0	0	0	32	172	0	0	316	379
4th Ave	James St	10/19/05	MD	35	851	117	0	0	0	36	225	0	0	266	223
4th Ave	James St	10/19/05	PM	32	<u>1427</u>	97	0	0	0	54	298	0	0	301	364
4th Ave	James St	5/2/06	AM	49	1352	79	0	0	0	33	202	0	0	352	374
4th Ave	James St	5/2/06	MD	23	948	108	0	0	0	26	232	0	0	352	248
4th Ave	James St	5/2/06	PM	27	<u>1867</u>	145	0	0	0	44	321	0	0	248	307
4th Ave	Cherry St	1/27/05	AM	0	<u>1434</u>	132	0	0	0	97	248	0	0	0	0

		Date	Time Period	NB Left	NB Thru	NB Right	SB Left	SBT Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
4th Ave	Cherry St	1/27/05	MD	0	889	202	0	0	0	90	266	0	0	0	0
4th Ave	Cherry St	1/27/05	PM	0	1499	313	0	0	0	121	624	0	0	0	0
4th Ave	Cherry St	1/27/05	AM	0	2017	211	0	0	0	153	252	0	0	0	0
4th Ave	Cherry St	1/27/05	MD	0	1005	242	0	0	0	70	264	0	0	0	0
4th Ave	Cherry St	1/27/05	PM	0	1661	350	0	0	0	146	583	0	0	0	0
4th Ave	Cherry St	5/2/06	AM	0	1699	183	0	0	0	143	235	0	0	0	0
4th Ave	Cherry St	5/2/06	MD	0	978	239	0	0	0	92	273	0	0	0	0
4th Ave	Cherry St	5/2/06	PM	0	1575	433	0	0	0	151	559	0	0	0	0
4th Ave	Union St	1/25/05	AM	177	1221	0	0	0	0	0	0	0	0	584	175
4th Ave	Union St	1/25/05	MD	99	941	0	0	0	0	0	0	0	0	400	187
4th Ave	Union St	1/25/05	PM	146	1352	0	0	0	0	0	0	0	0	634	220
4th Ave	Union St	10/19/05	AM	203	1392	0	0	0	0	0	0	0	0	602	213
4th Ave	Union St	10/19/05	MD	105	1031	0	0	0	0	0	0	0	0	401	179
4th Ave	Union St	10/19/05	PM	188	1888	0	0	0	0	0	0	0	0	583	242
4th Ave	Union St	5/2/06	AM	256	1504	0	0	0	0	0	0	0	0	595	161
4th Ave	Union St	5/2/06	MD	166	1185	0	0	0	0	0	0	0	0	585	203
4th Ave	Union St	5/2/06	PM	192	1993	0	0	0	0	0	0	0	0	539	271
6th Ave	University St	1/20/05	AM	0	1132	304	0	0	0	277	294	0	0	0	51
6th Ave	University St	1/20/05	MD	0	564	302	0	0	0	244	345	0	0	0	57
6th Ave	University St	1/20/05	PM	0	668	339	0	0	0	319	475	0	0	0	79
6th Ave	University St	10/25/05	AM	0	1011	259	0	0	0	326	221	0	0	0	58
6th Ave	University St	10/25/05	MD	0	596	281	0	0	0	278	319	0	0	0	55
6th Ave	University St	10/25/05	PM	0	799	319	0	0	0	400	449	0	0	0	168
6th Ave	University St	5/2/06	AM	0	1490	163	0	0	0	297	376	0	0	0	62
6th Ave	University St	5/2/06	MD	0	617	283	0	0	0	238	391	0	0	0	41
6th Ave	University St	5/2/06	PM	0	959	325	0	0	0	366	472	0	0	0	132
6th Ave	Olive Way	1/26/05	AM	0	562	257	0	0	0	77	328	0	0	0	0
6th Ave	Olive Way	1/26/05	MD	0	599	273	0	0	0	79	378	0	0	0	0
6th Ave	Olive Way	1/26/05	PM	0	825	366	0	0	0	87	423	0	0	0	0
6th Ave	Olive Way	10/26/05	AM	0	572	258	0	0	0	61	436	0	0	0	0
6th Ave	Olive Way	10/26/05	MD	0	542	298	0	0	0	63	371	0	0	0	0
6th Ave	Olive Way	10/26/05	PM	0	924	424	0	0	0	110	580	0	0	0	0
6th Ave	Olive Way	5/2/06	AM	0	575	235	0	0	0	50	427	0	0	0	0
6th Ave	Olive Way	5/2/06	MD	0	504	301	0	0	0	70	409	0	0	0	0
6th Ave	Olive Way	5/2/06	PM	0	916	437	0	0	0	100	623	0	0	0	0
2nd Ave	James St	1/25/05	AM	0	0	0	88	640	106	0	96	14	97	232	0
2nd Ave	James St	1/25/05	MD	0	0	0	62	507	74	0	80	9	64	168	0
2nd Ave	James St	1/25/05	PM	0	0	0	134	947	65	0	188	22	49	159	0
2nd Ave	James St	10/25/05	AM	0	0	0	98	674	91	0	91	11	74	209	0
2nd Ave	James St	10/25/05	MD	0	0	0	73	523	85	0	105	12	68	198	0
2nd Ave	James St	10/25/05	PM	0	0	0	159	880	50	0	230	20	46	217	0
2nd Ave	James St	5/2/06	AM	0	0	0	86	619	96	0	81	10	91	249	0
2nd Ave	James St	5/2/06	MD	0	0	0	86	524	60	0	93	16	57	175	0
2nd Ave	James St	5/2/06	PM	0	0	0	128	908	53	0	194	17	52	193	0
2nd Ave	Cherry St	1/26/05	AM	0	0	0	200	743	0	0	139	40	0	0	0

		Date	Time Period	NB Left	NB Thru	NB Right	SB Left	SBT Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
2nd Ave	Cherry St	1/26/05	MD	0	0	0	153	<u>544</u>	0	0	104	42	0	0	0
2nd Ave	Cherry St	1/26/05	PM	0	0	0	312	<u>1009</u>	0	0	<u>345</u>	91	0	0	0
2nd Ave	Cherry St	10/26/05	AM	0	0	0	245	831	0	0	140	40	0	0	0
2nd Ave	Cherry St	10/26/05	MD	0	0	0	167	<u>652</u>	0	0	116	54	0	0	0
2nd Ave	Cherry St	10/26/05	PM	0	0	0	265	<u>1112</u>	0	0	295	63	0	0	0
2nd Ave	Cherry St	5/2/06	AM	0	0	0	233	781	0	0	150	38	0	0	0
2nd Ave	Cherry St	5/2/06	MD	0	0	0	136	<u>646</u>	0	0	131	56	0	0	0
2nd Ave	Cherry St	5/2/06	PM	0	0	0	264	934	0	0	<u>218</u>	54	0	0	0
2nd Ave	Spring St	1/26/05	AM	0	0	0	<u>226</u>	<u>1021</u>	0	0	266	43	0	0	0
2nd Ave	Spring St	1/26/05	MD	0	0	0	<u>215</u>	<u>728</u>	0	0	217	59	0	0	0
2nd Ave	Spring St	1/26/05	PM	0	0	0	243	<u>1127</u>	0	0	272	114	0	0	0
2nd Ave	Spring St	11/1/05	AM	0	0	0	332	<u>1229</u>	0	0	279	52	0	0	0
2nd Ave	Spring St	11/1/05	MD	0	0	0	229	<u>873</u>	0	0	211	63	0	0	0
2nd Ave	Spring St	11/1/05	PM	0	0	0	292	<u>1277</u>	0	0	303	112	0	0	0
2nd Ave	Spring St	5/2/06	AM	0	0	0	<u>383</u>	<u>1271</u>	0	0	277	102	0	0	0
2nd Ave	Spring St	5/2/06	MD	0	0	0	<u>253</u>	<u>951</u>	0	0	296	54	0	0	0
2nd Ave	Spring St	5/2/06	PM	0	0	0	305	<u>1472</u>	0	0	289	124	0	0	0
2nd Ave	University St	1/25/05	AM	0	0	0	148	<u>1014</u>	0	0	273	17	0	0	0
2nd Ave	University St	1/25/05	MD	0	0	0	114	<u>717</u>	0	0	152	30	0	0	0
2nd Ave	University St	1/25/05	PM	0	0	0	161	<u>994</u>	0	0	229	30	0	0	0
2nd Ave	University St	11/2/05	AM	0	0	0	189	<u>1205</u>	0	0	276	18	0	0	0
2nd Ave	University St	11/2/05	MD	0	0	0	123	<u>834</u>	0	0	204	40	0	0	0
2nd Ave	University St	11/2/05	PM	0	0	0	217	<u>1128</u>	0	0	233	36	0	0	0
2nd Ave	University St	5/2/06	AM	0	0	0	237	<u>1408</u>	0	0	301	15	0	0	0
2nd Ave	University St	5/2/06	MD	0	0	0	181	<u>836</u>	0	0	200	35	0	0	0
2nd Ave	University St	5/2/06	PM	0	0	0	194	<u>1378</u>	0	0	292	41	0	0	0
3rd Ave	Pine St	1/27/05	AM	39	<u>378</u>	0	0	<u>339</u>	6	0	0	0	17	244	32
3rd Ave	Pine St	1/27/05	MD	32	297	0	0	253	14	0	0	0	15	292	23
3rd Ave	Pine St	1/27/05	PM	26	<u>680</u>	0	0	<u>419</u>	42	0	0	0	21	<u>329</u>	58
3rd Ave	Pine St	10/27/05	AM	3	<u>181</u>	0	0	<u>107</u>	2	0	0	0	7	262	32
3rd Ave	Pine St	10/27/05	MD	29	351	0	0	262	16	0	0	0	18	336	27
3rd Ave	Pine St	10/27/05	PM	4	<u>258</u>	0	0	<u>150</u>	45	0	0	0	10	388	32
3rd Ave	Pine St	5/2/06	AM	1	<u>140</u>	0	0	<u>83</u>	4	0	0	0	4	246	28
3rd Ave	Pine St	5/2/06	MD	24	227	0	0	227	24	0	0	0	7	293	28
3rd Ave	Pine St	5/2/06	PM	9	<u>188</u>	0	0	<u>181</u>	59	0	0	0	5	<u>459</u>	47
3rd Ave	Stewart St	2/2/05	AM	53	<u>266</u>	72	0	<u>240</u>	61	0	0	0	68	624	95
3rd Ave	Stewart St	2/2/05	MD	29	269	59	0	226	35	0	0	0	60	375	66
3rd Ave	Stewart St	2/2/05	PM	10	<u>633</u>	125	0	297	<u>68</u>	0	0	0	104	<u>444</u>	85
3rd Ave	Stewart St	11/1/05	AM	8	<u>111</u>	36	0	<u>43</u>	126	0	0	0	50	564	106
3rd Ave	Stewart St	11/1/05	MD	28	191	33	0	142	45	0	0	0	43	269	20
3rd Ave	Stewart St	11/1/05	PM	1	<u>219</u>	51	0	57	<u>191</u>	0	0	0	62	<u>328</u>	29
3rd Ave	Stewart St	5/2/06	AM	3	<u>141</u>	53	0	<u>79</u>	122	0	0	0	59	650	100
3rd Ave	Stewart St	5/2/06	MD	30	229	61	0	153	42	0	0	0	69	371	38
3rd Ave	Stewart St	5/2/06	PM	10	<u>188</u>	28	0	153	141	0	0	0	69	386	34
3rd Ave	Virginia St	1/27/05	AM	0	<u>200</u>	31	39	<u>250</u>	0	27	271	56	0	0	0

		Date	Time Period	NB Left	NB Thru	NB Right	SB Left	SBT Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
3rd Ave	Virginia St	1/27/05	MD	0	199	36	50	168	0	67	302	45	0	0	0
3rd Ave	Virginia St	1/27/05	PM	0	<u>480</u>	119	63	256	0	67	445	45	0	0	0
3rd Ave	Virginia St	11/3/05	AM	0	116	49	41	119	0	25	307	65	0	0	0
3rd Ave	Virginia St	11/3/05	MD	0	216	80	48	172	0	58	311	50	0	0	0
3rd Ave	Virginia St	11/3/05	PM	0	271	137	72	183	0	69	543	37	0	0	0
3rd Ave	Virginia St	5/2/06	AM	0	84	58	30	119	0	36	279	63	0	0	0
3rd Ave	Virginia St	5/2/06	MD	0	210	77	41	165	0	43	309	22	0	0	0
3rd Ave	Virginia St	5/2/06	PM	0	205	140	64	158	0	56	459	46	0	0	0
3rd Ave	Lenora St	2/1/05	AM	39	<u>185</u>	0	0	262	28	0	0	0	28	120	38
3rd Ave	Lenora St	2/1/05	MD	38	215	0	0	187	30	0	0	0	55	128	33
3rd Ave	Lenora St	2/1/05	PM	102	<u>453</u>	0	0	200	23	0	0	0	59	<u>165</u>	69
3rd Ave	Lenora St	11/1/05	AM	30	89	0	0	156	28	0	0	0	32	217	37
3rd Ave	Lenora St	11/1/05	MD	41	183	0	0	143	26	0	0	0	42	124	30
3rd Ave	Lenora St	11/1/05	PM	52	205	0	0	149	38	0	0	0	66	327	65
3rd Ave	Lenora St	5/2/06	AM	29	83	0	0	165	29	0	0	0	24	172	36
3rd Ave	Lenora St	5/2/06	MD	66	206	0	0	177	24	0	0	0	57	155	37
3rd Ave	Lenora St	5/2/06	PM	52	219	0	0	126	15	0	0	0	75	267	89
2nd Ave	Lenora St	2/1/05	AM	0	0	0	0	<u>1181</u>	38	0	0	0	93	110	0
2nd Ave	Lenora St	2/1/05	MD	0	0	0	0	587	71	0	0	0	101	122	0
2nd Ave	Lenora St	2/1/05	PM	0	0	0	0	<u>741</u>	83	0	0	0	199	188	0
2nd Ave	Lenora St	11/1/05	AM	0	0	0	0	1241	56	0	0	0	101	100	0
2nd Ave	Lenora St	11/1/05	MD	0	0	0	0	558	52	0	0	0	104	143	0
2nd Ave	Lenora St	11/1/05	PM	0	0	0	0	794	100	0	0	0	195	229	0
2nd Ave	Lenora St	5/2/06	AM	0	0	0	0	1332	47	0	0	0	90	108	0
2nd Ave	Lenora St	5/2/06	MD	0	0	0	0	633	53	0	0	0	117	129	0
2nd Ave	Lenora St	5/2/06	PM	0	0	0	0	945	176	0	0	0	255	236	0
2nd Ave	Stewart St	2/3/05	AM	0	0	0	0	<u>1183</u>	34	0	0	0	250	221	0
2nd Ave	Stewart St	2/3/05	MD	0	0	0	0	632	84	0	0	0	185	229	0
2nd Ave	Stewart St	2/3/05	PM	0	0	0	0	976	147	0	0	0	<u>298</u>	<u>340</u>	0
2nd Ave	Stewart St	11/3/05	AM	0	0	0	0	1346	41	0	0	0	332	242	0
2nd Ave	Stewart St	11/3/05	MD	0	0	0	0	593	64	0	0	0	209	242	0
2nd Ave	Stewart St	11/3/05	PM	0	0	0	0	931	129	0	0	0	404	371	0
2nd Ave	Stewart St	5/2/06	AM	0	0	0	0	1274	39	0	0	0	263	211	0
2nd Ave	Stewart St	5/2/06	MD	0	0	0	0	679	52	0	0	0	176	227	0
2nd Ave	Stewart St	5/2/06	PM	0	0	0	0	992	72	0	0	0	344	230	0
2nd Ave	Pine St	2/3/05	AM	0	0	0	0	<u>1210</u>	14	0	0	0	139	100	0
2nd Ave	Pine St	2/3/05	MD	0	0	0	0	<u>674</u>	34	0	0	0	151	120	0
2nd Ave	Pine St	2/3/05	PM	0	0	0	0	<u>1033</u>	41	0	0	0	<u>179</u>	<u>159</u>	0
2nd Ave	Pine St	2/3/05	AM	0	0	0	0	1484	21	0	0	0	162	92	0
2nd Ave	Pine St	2/3/05	MD	0	0	0	0	858	30	0	0	0	169	139	0
2nd Ave	Pine St	2/3/05	PM	0	0	0	0	1132	30	0	0	0	195	174	0
2nd Ave	Pine St	5/2/06	AM	0	0	0	0	1688	18	0	0	0	155	109	0
2nd Ave	Pine St	5/2/06	MD	0	0	0	0	729	45	0	0	0	144	45	0
2nd Ave	Pine St	5/2/06	PM	0	0	0	0	1265	20	0	0	0	396	265	0
1st Ave	Spring St	2/2/05	AM	0	<u>446</u>	93	124	<u>416</u>	0	42	165	41	0	0	0

		Date	Time Period	NB Left	NB Thru	NB Right	SB Left	SBT Thru	SB Right	EB Left	EB Thru	EB Right	WB Left	WB Thru	WB Right
1st Ave	Spring St	2/2/05	MD	0	427	68	55	523	0	17	147	52	0	0	0
1st Ave	Spring St	2/2/05	PM	0	595	90	128	889	0	73	207	113	0	0	0
1st Ave	Spring St	11/2/05	AM	0	647	95	116	476	0	38	156	62	0	0	0
1st Ave	Spring St	11/2/05	MD	0	402	73	64	473	0	26	164	49	0	0	0
1st Ave	Spring St	11/2/05	PM	0	786	63	71	655	0	65	193	76	0	0	0
1st Ave	Spring St	5/2/06	AM	0	626	140	139	617	0	40	169	43	0	0	0
1st Ave	Spring St	5/2/06	MD	0	414	75	51	488	0	28	144	53	0	0	0
1st Ave	Spring St	5/2/06	PM	0	719	60	65	737	0	52	182	86	0	0	0
1st Ave	Columbia St	2/2/05	AM	53	498	0	0	295	97	0	0	0	131	325	124
1st Ave	Columbia St	2/2/05	MD	71	348	0	0	286	148	0	0	0	54	362	98
1st Ave	Columbia St	2/2/05	PM	95	527	0	0	380	331	0	0	0	43	1272	114
1st Ave	Columbia St	11/3/05	AM	54	656	0	0	314	109	0	0	0	140	277	143
1st Ave	Columbia St	11/3/05	MD	56	392	0	0	342	171	0	0	0	58	322	99
1st Ave	Columbia St	11/3/05	PM	89	553	0	0	360	318	0	0	0	58	930	153
1st Ave	Columbia St	5/2/06	AM	72	590	0	0	335	126	0	0	0	140	370	148
1st Ave	Columbia St	5/2/06	MD	62	422	0	0	326	168	0	0	0	59	339	102
1st Ave	Columbia St	5/2/06	PM	176	538	0	0	371	326	0	0	0	54	982	94
Western Ave	Yesler Way	2/2/05	AM	0	0	0	146	0	15	61	102	0	0	65	82
Western Ave	Yesler Way	2/2/05	MD	0	0	0	106	0	22	35	74	0	0	83	50
Western Ave	Yesler Way	2/2/05	PM	0	0	0	194	0	15	92	87	0	0	97	127
Western Ave	Yesler Way	11/8/05	AM	0	0	0	170	0	9	62	82	0	0	70	76
Western Ave	Yesler Way	11/8/05	MD	0	0	0	139	0	16	37	73	0	0	88	56
Western Ave	Yesler Way	11/8/05	PM	0	0	0	257	0	21	67	131	0	0	131	113
Western Ave	Yesler Way	5/2/06	AM	0	0	0	162	0	13	77	87	0	0	64	101
Western Ave	Yesler Way	5/2/06	MD	0	0	0	119	0	27	45	86	0	0	67	64
Western Ave	Yesler Way	5/2/06	PM	0	0	0	247	0	38	err	165	0	0	142	151
3rd Ave	Yesler Way	2/1/05	AM	43	132	9	58	57	20	16	162	16	29	208	169
3rd Ave	Yesler Way	2/1/05	MD	18	60	2	72	62	37	34	117	12	15	125	133
3rd Ave	Yesler Way	2/1/05	PM	20	91	4	160	96	33	25	129	9	17	217	243
3rd Ave	Yesler Way	10/27/05	AM	2	62	0	55	55	19	18	129	26	27	214	111
3rd Ave	Yesler Way	10/27/05	MD	15	80	4	62	79	42	38	106	6	28	115	169
3rd Ave	Yesler Way	10/27/05	PM	0	93	0	52	80	10	20	221	8	14	212	157
3rd Ave	Yesler Way	5/2/06	AM	7	79	2	47	56	11	15	161	20	125	233	125
3rd Ave	Yesler Way	5/2/06	MD	14	95	4	95	81	17	24	105	7	25	123	129
3rd Ave	Yesler Way	5/2/06	PM	0	125	7	184	80	3	18	184	8	20	207	135

Travel Time for General Purpose Traffic

Figures 5A, 3B, and 3C illustrate travel time along selected segments for before and after tunnel closure. After tunnel closure travel time surveys were conducted in October 2005 and May 2006.

Figure 5A. General Purpose Travel Time AM Peak (7 – 9 am)

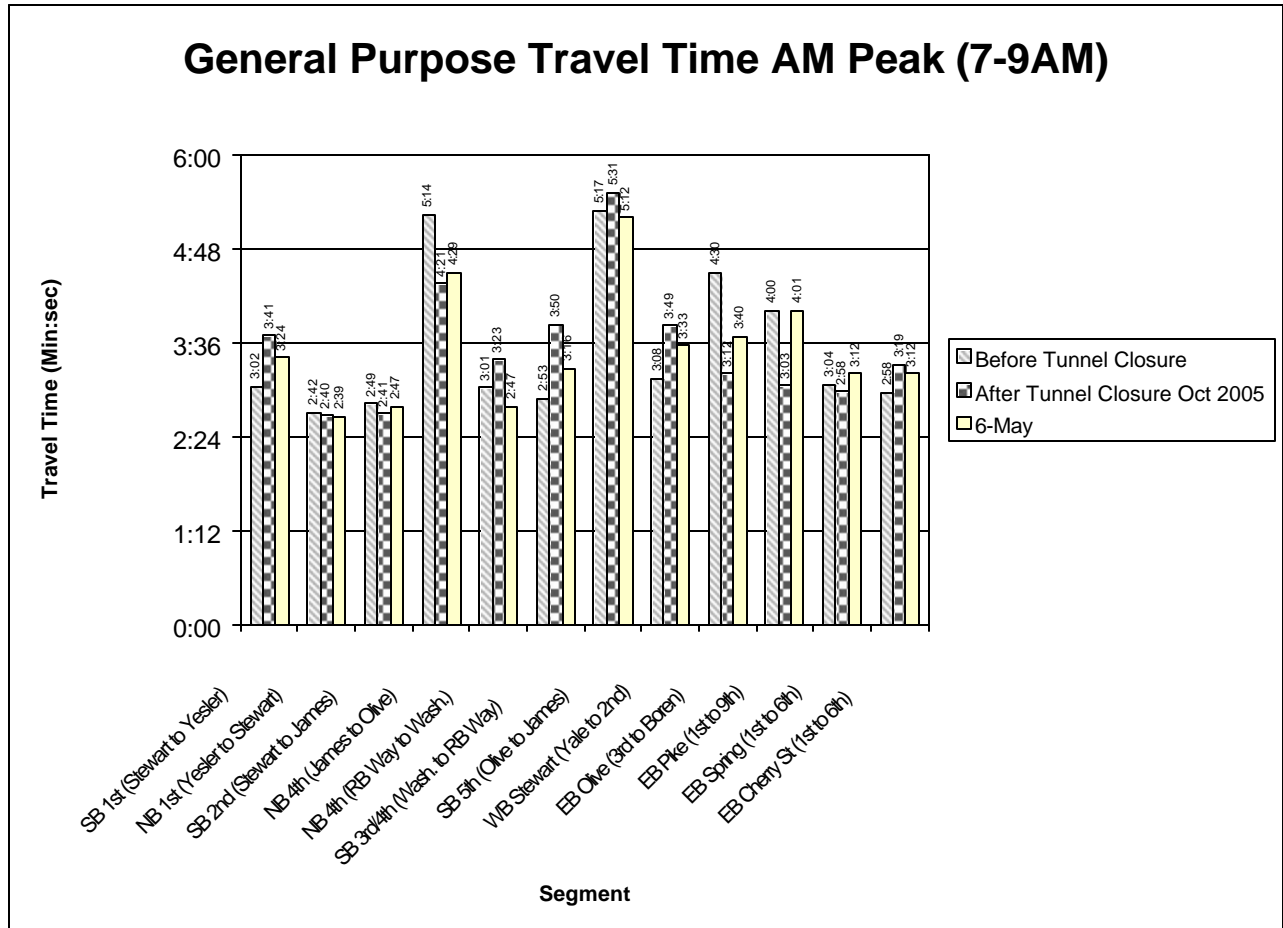


Figure 5B. General Purpose Travel Time PM Peak (4-6 pm)

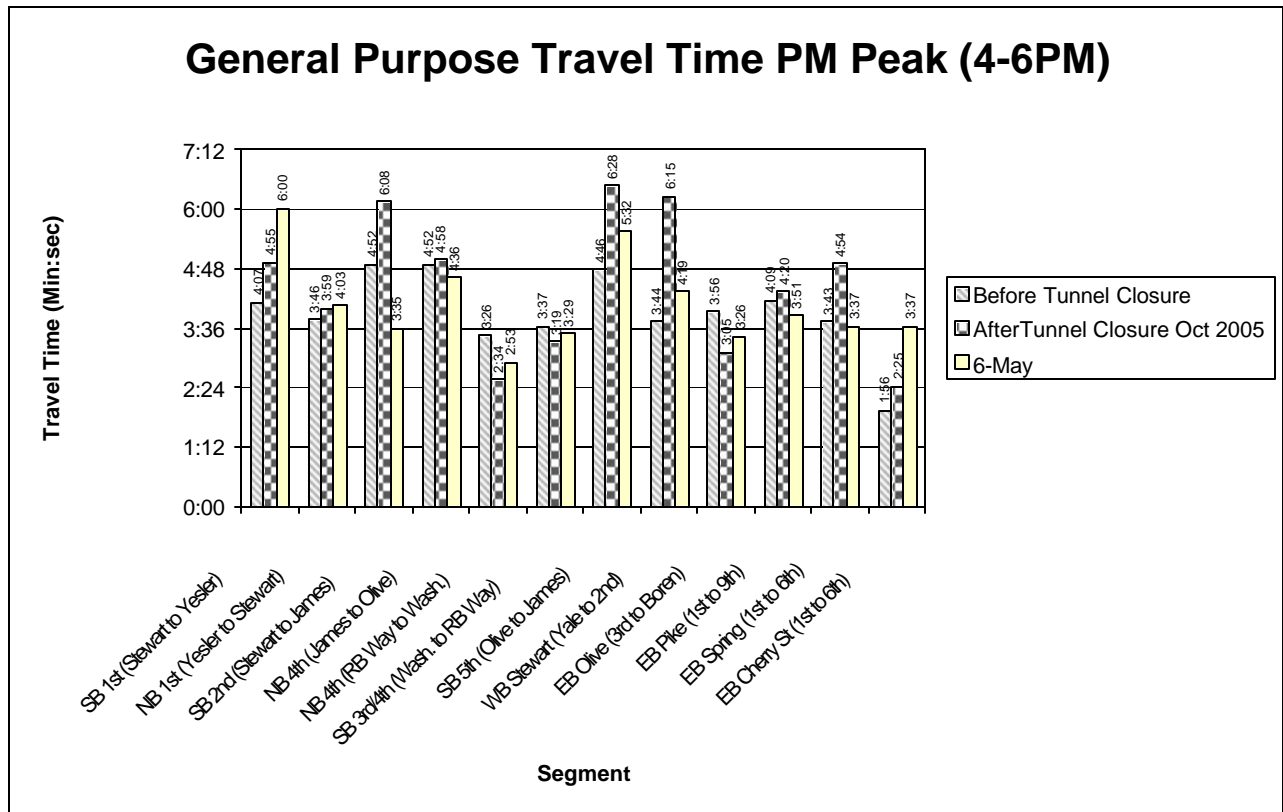
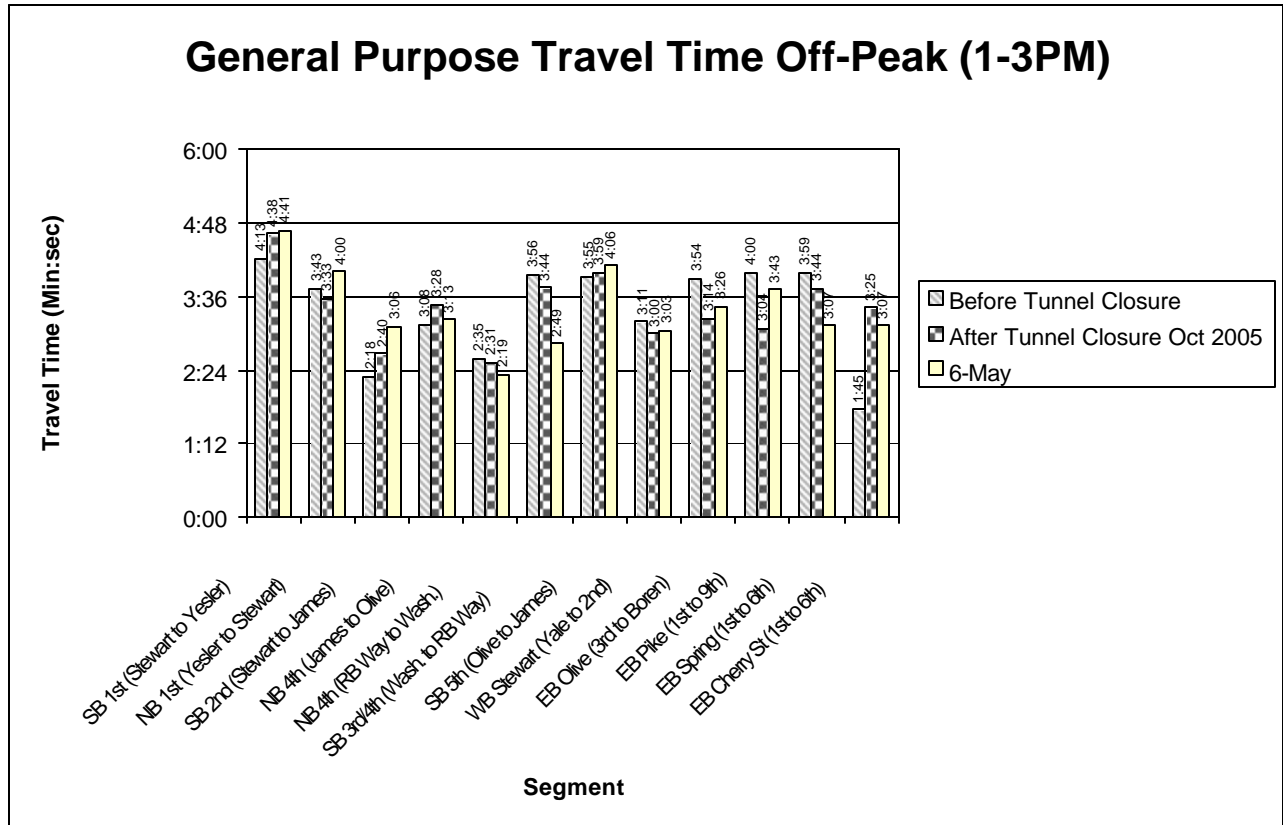


Figure 5C. General Purpose Travel Time Off-Peak (1-3 pm)



Measure 3: Transit Ridership and Bus Volumes

Monitoring Objectives

The purpose of monitoring transit passenger and bus volumes is as follows:

- Provide data on bus volumes by street segment in downtown Seattle
- Measure the average weekday PM peak hour and weekday passenger loads crossing the Seattle CBD north-south screen line
- Provide data as available from Community Transit and Pierce Transit on average ridership crossing the north-south screen line during average PM peak hours and weekdays
- Identify and analyze any substantive changes in ridership or bus volumes for before and after tunnel closure conditions

Methodology

Baseline bus volumes used for this analysis were extracted from HASTUS - the King County Metro scheduling system using the February 2005 service change. These counts include in service as well as out of service coaches. A projection of bus volumes on downtown streets for after tunnel closure was issued with Volume 1, the Baseline Report. These projected bus volumes have subsequently been compared with actual bus volumes for service changes that occurred after tunnel closure. Volume 1 provided a comparison with bus volumes derived from the September 2005 service change. Volume 2 provided a comparison with bus volumes as of December 2005 that reflected routing adjustments made to address operating impacts on Stewart Street. Volume 4 provides a comparison with bus volumes as of the June 2006 service change.

For passenger loads, the Automated Passenger Count (APC) system is the primary source for passenger data for Metro coaches. APC data is collected in a random sample during each signup, downloaded and processed monthly. This data is summarized in a final form at the end of each signup. Preliminary data, based on smaller samples, is available monthly. Metro driver count data is collected on an ad hoc basis when preliminary APC results indicate that observations of trips on a particular route will fall below an adequate sample. Ridership data on Community Transit and Pierce Transit service is generated by the monitor reports supplied by each of these agencies. The ridership data from Community Transit and Pierce Transit is available by signup at the aggregate level.

APC data, supplemented by driver counts and estimates for any non-APC observed trips, was used to estimate Metro ridership volumes crossing the screen line just south of University Street, by trip, for the spring 2004 and fall 2005 signups during the PM peak hour and the average weekday. The results have been summarized by street and by direction to compare ridership volumes and loads before and after tunnel closure.

Bus Volumes

As reported in Volume 3, the bus volumes that were projected for downtown street segments during tunnel closure, as shown in the Volume 1 Baseline report, are summarized in Figure 4A. The actual post tunnel bus volumes for downtown streets for the June 2006 service change are shown in Figure 4B.

Bus volumes in the CBD during the PM Peak continue to be essentially the same for most links as projected. The PM Peak period used for determining transit volumes is 4:30 to 5:30pm. Slight variations in volumes are due to schedule adjustments that change a trip from being within or included or excluded from the measured peak hour. The substantive changes for the baseline projection continue to be changes in bus volumes due to the relocation of a 4 trips from 2nd Avenue to Third Avenue, and the service adjustments on Stewart Street.

Figure 6A. PM Peak Hour Transit Volumes - Projected in September 2005 Baseline Report

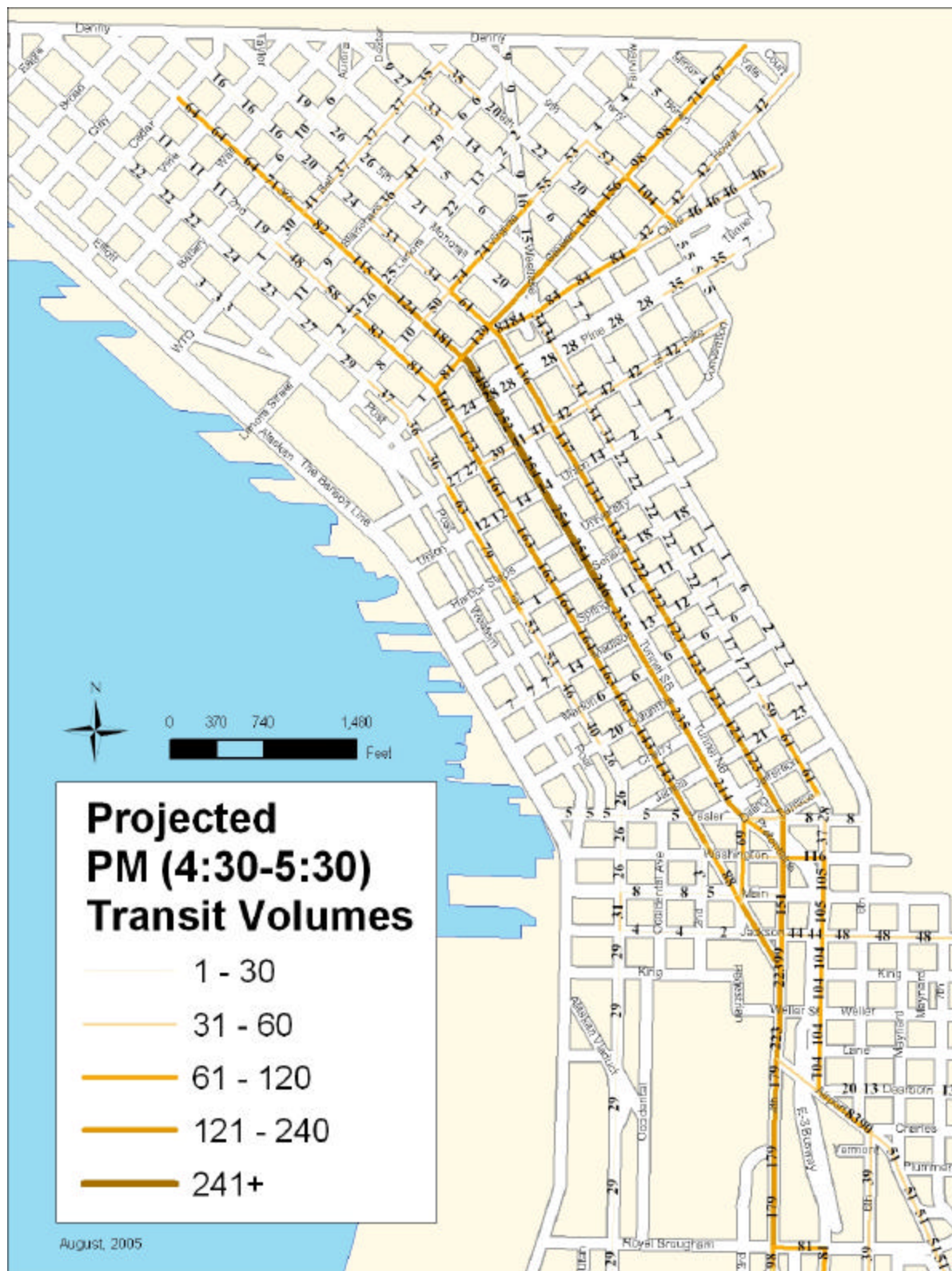
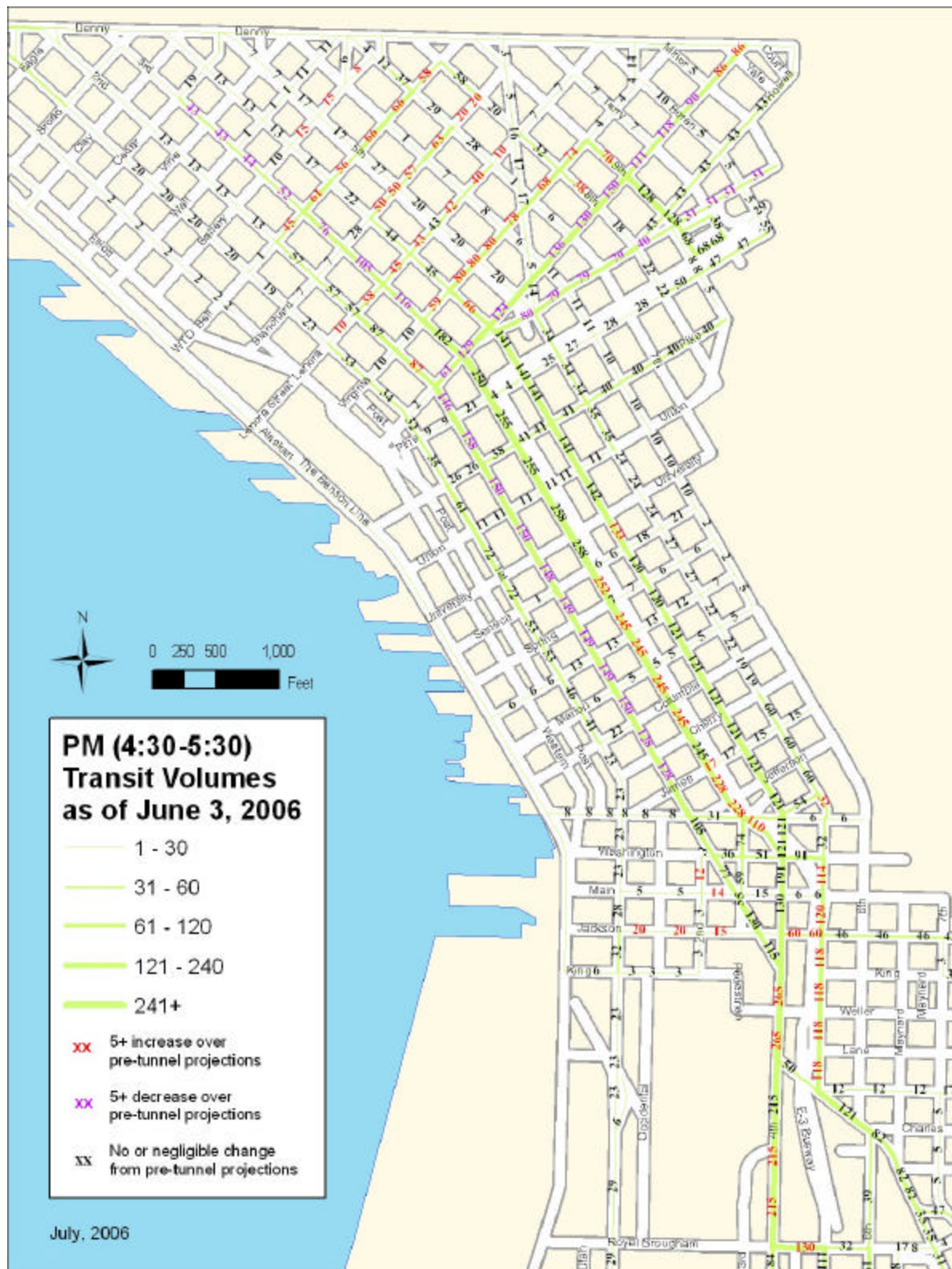


Figure 6B. PM Peak Hour Transit Volumes as of 6/3/06



Transit Ridership Volumes

Approximately 95,000 north-south riders crossed the downtown screenline at University Street on weekdays in Fall 2004. As part of a general increase in ridership, this number increased to almost 106,700 weekday riders in spring 2005. By comparison, in spring 2006 downtown loads crossing University Street had fallen from the previous years' level, to 103,000.

Table 7 compares spring 2006 ridership at University Street with the baseline Spring 2005 loads. Average weekday loads decreased by approximately 3.4 percent. However, the total load crossing the screenline during the peak hour from 4:30 to 5:30 pm actually increased by about 0.8 percent.

Table 7. Passenger Loads at University Street, before and after Tunnel Closure

		Weekday Riders		Change	1-Hr PM Peak Riders		Change
Avenue	Dir	Spring 2005	Spring 2006		Spring 2005	Spring 2006	
First	N	9,861	9,703	-1.6%	757	721	-4.8%
	S	6,002	5,633	-6.1%	469	634	+35.2%
Second	S	16,423	14,642	-10.8%	2,465	2,340	-5.1%
Third	N	17,849	27,763	+55.5%	1,478	2,870	+94.2%
	S	17,239	25,074	+45.4%	1,883	3,306	+75.6%
Fourth	N	10,375	15,223	+46.7%	825	1,118	+35.5%
Fifth	S	3,046	4,934	+62.0%	155	277	+78.7%
Tunnel	N	12,991	N.A.		1,188	N.A.	
	S	14,495	N.A.		1,959	N.A.	
Total		106,651	102,972	-3.4%	11,179	11,266	+0.8%

Table 8 compares spring 2006 data for standing loads at University Street with the baseline Spring 2005 standing loads. The overall incidence of standing loads has fallen below pre-tunnel closure levels, both on average during the weekday and during the peak 1-hr. Average weekday loads greater than seating capacity have increased in incidence on Second Avenue and Third Avenue northbound, and First Avenue northbound saw a small increase in the incidence of loads over 20 percent of seating capacity. All of these increases were well below the level of concern. The incidence of standing loads during the peak hour in spring 2006 was similar to or less than the incidence in spring 2005.

Table 8. Loads over Seating Capacity at University Street, before and after Tunnel Closure

		Average Loads Greater than Seat Capacity				Average Loads 20% over Seating Capacity			
		% of Weekday Trips		% of Peak 1-Hr Trips		% of Weekday Trips		% of Peak 1-Hr Trips	
Avenue	Dir	Spring 05	Spr 06	Spring 05	Spr 06	Spring 05	Spr 06	Spring 05	Spr 06
First	N	1.8%	1.1%	7.5%	5.4%	0.0%	0.2%	0.0%	0.0%
	S	1.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Second	S	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Third	N	1.2%	1.4%	1.5%	0.8%	0.2%	0.1%	0.0%	0.0%
	S	5.0%	2.2%	4.7%	3.6%	1.3%	0.4%	1.6%	0.0%
Fourth	N	0.5%	0.3%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
Fifth	S	0.8%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%
Tunnel	N	0.4%	N.A.	0.0%	N.A.	0.0%	N.A.	0.0%	N.A.
	S	0.2%	N.A.	0.0%	N.A.	0.0%	N.A.	0.0%	N.A.
Total		1.3%	1.1%	1.4%	1.4%	0.3%	0.1%	0.2%	0.0%

Spring 2006 data indicates that loads leaving the CBD have dropped since spring 2005, from 90,800 to 87,600 riders each weekday. However, standing loads have increased, although, again, they are still a small fraction of outbound trips. Table 9 compares the percent of trips with standing loads leaving downtown at various times of the day. The largest increase, not surprisingly, is in the PM peak, when 4.5 percent of trips leaving the Seattle CBD had standing loads, as compared to 3.4 percent of trips in spring 2005. This increase was spread across a number of routes, including ones not likely to be directly affected by tunnel closure.

Table 9. Percent of Trips Leaving CBD Averaging Standing Loads, before and after Tunnel Closure.

		AM Peak	Midday	PM Peak	Evening	Total
		6-9 AM	9AM-3 PM	3-7 PM	7-11 PM	
Standing Loads	Spring 2005	2.4%	2.7%	3.4%	0.3%	2.4%
	Spring 2006	2.1%	3.4%	4.5%	2.0%	3.3%
Over 120% Load	Spring 2005	0.0%	0.7%	0.5%	0.0%	0.4%
	Spring 2006	0.4%	1.0%	0.6%	0.3%	0.6%

Measure 5: Seattle Central Business District (CBD) Customer Surveys

Monitoring Objectives

- Formally assess downtown user perceptions, behavior and satisfaction levels before and during tunnel closure and after the tunnel reopens to transit use in order to assess the effectiveness of the mitigation measures sponsored by the interagency Monitor and Maintain (M & M) team.
- Collect informal feedback from downtown user after tunnel closure to better understand if the mitigation efforts are working well or poorly and to identify key areas for immediate improvement or fine-tuning.

Methodology

There are two survey instruments that are being employed to gauge the public reaction to tunnel closure.

The first instrument is a formal survey employing the services of a full service research consultant who will survey randomly selected cluster samples downtown of groups targeted for the survey. The type of information collected from bus riders is as follows: purpose of downtown travel; frequency of downtown travel and changes in that frequency; changes in using the bus to travel downtown; overall impression of downtown Seattle; and transit rider satisfaction or dissatisfaction with a number of factors such as travel time by bus through downtown, personal space when waiting at stops, time between buses, on-time performance of buses, location of stops predictability of bus arrivals and departures, and personal security waiting for buses when dark and during the day.

The type of information collected from drivers will include: purpose of downtown travel; frequency of downtown travel and changes in that frequency; changes in using a car to travel to downtown; overall impression of downtown Seattle; and driver satisfaction or dissatisfaction with travel time through downtown by car, convenience of routes through downtown by car, clarity of information (signage, rules) for drivers downtown, ability to park downtown, convenience of parking to destination, and cost of parking

Information from both drivers and transit users will be collected to learn about their general satisfaction or dissatisfaction with the following: being able to walk around downtown without feeling crowded; personal security when walking around downtown; adequacy/clarity of information given to downtown users about the tunnel project; things that are working well and working poorly; performance of those responsible for helping ease disruptions; and recommendations for needed changes or adjustments. Approximately 1,000 downtown users will be surveyed with each formal survey. The survey itself will require 10 – 15 minutes to complete.

A formal “before” survey was conducted in spring 2005. The results of this “before” survey were reported in the Volume 1 Baseline Report that was issued in September 2005. Readers are referred to Volume 1: Baseline Conditions for the complete discussion of this “before” survey. However, one of the main conclusions for this survey was that the respondents generally had a positive impression of the downtown, that they did not feel crowded when moving around downtown and that they were satisfied with their personal security and safety.

These results will be updated with two more formal surveys. The data collection for the first update was conducted during tunnel closure in the summer 2006 and the results of this survey will be available in December, 2006. A third and final survey will be conducted after the tunnel reopens to transit travel in the fall of 2007.

The second instrument that has been used to gauge public opinion about tunnel closure are smaller intercept surveys using sample of approximately 200 to 300 downtown users. These intercept surveys provide some qualitative feedback on what downtown constituents are feeling about tunnel closure. Given

the difference in methodology and sample size, it should be emphasized that the results of the quick feedback survey cannot be compared with the results of the more formal customer surveys of downtown users described above. They should be viewed as providing information that is similar to the type of information that can be gotten from small focus groups.

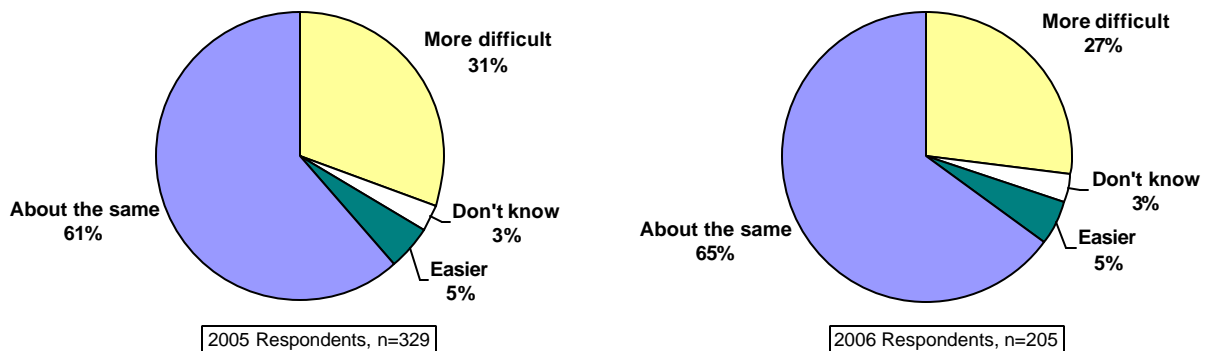
Summary Observations—Informal Intercept Survey, Spring 2006

Results from the spring 2006 quick feedback survey were consistent with results from fall 2005. Except as noted below, patterns were the same. The majority of respondents who participated in the 2006 survey felt it was not more difficult to get to downtown, that their buses were on time and that the convenience of their bus stop locations has not changed. However, a sizable minority of respondents continue to feel these travel elements had gotten worse since the tunnel closed. Respondents were evenly divided on whether it now takes more time to get through downtown and whether downtown is more crowded than before the tunnel closure.

Ease of Traveling to Downtown

Most respondents (65%) think getting to downtown is about the same as it was before the tunnel closed. Just over one in four respondents (27%) said getting downtown is more difficult than it used to be (Figure 1). This is a small change from 2005 when a little over 61 % of respondents felt that travel to downtown before and after tunnel closure was about the same, and 31% felt it was more difficult.

Figure 7. Ease of traveling to downtown



Why Travel to Downtown is More Difficult

Respondents who said travel to downtown is more difficult than in the past were asked what makes it more difficult. The most commonly mentioned response was that traffic is worse (40%) followed by slower buses (33%) and too many buses on surface streets (16%). Although the percentage of respondents who feel this way about these elements is less than in 2005, traffic congestion and time continues rate high among respondents as reasons given for difficulty with traveling to downtown. Elements that were rated worse by respondents in 2006 were Too many buses on surface streets (16%); where buses go and where stops are (13%); and hard to drive/navigate in downtown (11%). Table 10 provides a listing of all responses in descending order of mention.

Table 10. Reasons Why Travel to Downtown is More Difficult

Respondents who said it is more difficult to travel to downtown Seattle

Q: In what way is it (getting to downtown) more difficult?

	2005 (n=102)	2006 (n=53)
Traffic is worse	51	40
Bus is slower/Trips take longer	49	33
Buses not on schedule	16	2
Stops have been moved/removed	14	11
Hard to drive/navigate in downtown	4	11
Too many buses on surface streets	3	16
Because tunnel is closed (general)	3	2
Where buses go and where stops are is confusing	2	13
Tunnel was more convenient		7
More people on street		4
Other	7	4
Don't know	1	

Downtown Locations Where Vehicle Traffic is Difficult

Bus riders who said it takes longer to get through downtown since the tunnel closed were asked to identify the locations where vehicle traffic is the most difficult. Responses were tallied based on the number of times each street was mentioned. The streets most commonly mentioned as problem areas were: Third Avenue, Fourth Avenue, Second Avenue, Pike Street and Stewart Street. The only notable change from 2005 results is that fewer respondents (17% vs. 23%) noted Stewart Street as a street where traffic is difficult. A complete list of street names in descending order of mention is shown in Table 11.

Table 11. Downtown Locations Where Vehicle Traffic is Difficult

Bus riders who said travel time through downtown is worse than before tunnel closure			
Street Name (Base)	Total (76)	Street Name (Base)	Total (76)
3 rd Avenue	38	6 th Avenue	4
4 th Avenue	25	Pioneer Square	3
2 nd Avenue	22	Jefferson	3
Pike	17	Cherry	3
Stewart	17	Royal Brougham	3
University	13	Chinatown/International District	3
Jackson	13	Denny	1
Pine	12	Eastlake	1
Seneca	8	Westlake	1
5 th Avenue	7	11 th	1
Union	7	Spring	1
Virginia	7	Marion	1
Columbia	7	1 st Avenue	1
James	5	Harvard	1
Howell	5	Fairview	1
9 th Avenue	5	Downtown (general)	1
Madison	4	Pike Place Market	1
7 th Avenue	4	Spokane	1
Safeco Field	4	Other	12
Olive Way	4	Don't know	3
Getting on/off freeway	4		
Question 16B: At what locations does the vehicle traffic seem to be the most difficult?			
Multiple responses accepted.			

Tunnel Closure Information

Nearly eight in ten respondents (78%) recalled seeing or hearing information about the tunnel closure after September 24, 2005. Respondents who have seen information about the tunnel closure since the tunnel closed in September most commonly mentioned seeing tunnel signage (44%)—especially signs at the bus tunnel (36%)—or getting information from a transit agency (22%).

In contrast to before the tunnel closed, just 12% said they heard about the tunnel closure from a major media source after September 24, 2005.

Table 12. Sources of Information about Tunnel Closure

Q: *Where did you see that information (before tunnel closed)?*

Q: *Since September 24, where have you seen information about the tunnel closure?*

	Before Tunnel Closure (n=307)	Since Sept. 2005 (n=267)	Spring 2006 (n=205)
Major Media (Net)	41%	19%	12%
Newspaper articles	25	11	9
TV news	20	9	6
Radio	6	1	<1
Tunnel Signage (Net)	39%	48%	44%
Signs at bus tunnel	23	29	36
Signs posted on downtown streets	17	21	9
Transit Agency (Net)	39%	45%	22%
Signs at bus stops	13	23	12
Transit agency brochures	9	8	2
Posters/signs on the bus	9	7	6
Rider alerts	9	8	<1
Bus or transit agency websites	4	5	3
Timetables	1	2	<1
Rider information call centers	<1	1	2
(Metro) reps handing out information			2
Word of Mouth	16%	9%	3%
At Work	14%	4%	2%
Other (Net)	7%	10%	4%
Email	3	1	-
Regular mail	2	2	2
Non-transit websites	2	2	-
Public events	<1	1	-
Police activity/people getting tickets	0	3	
Other	1	1	2

How Informative Was the Information Received

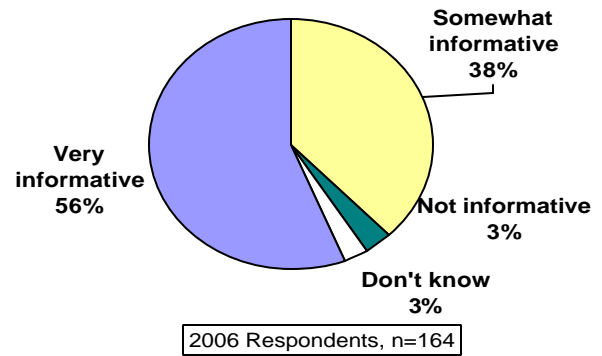
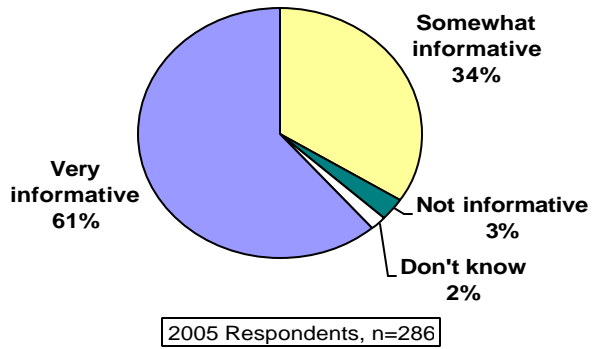
Respondents who reported seeing information about the tunnel closure after September 24, 2005 were asked to rate the information they received. As Figure 6 shows, over half of the respondents (56%) found the information *very informative* and an additional 38% said it was *somewhat informative*. Although there was a decrease in the number of respondents who found tunnel information *very informative* in 2006, the majority continue to feel the information they received is at least informative.

Respondents who received information from a transit website or transit brochures were the most likely to say the information they received was *very informative* (80% each).

Figure 8. How Informative was the Information Received?

Respondents Who Saw Information about the Tunnel Closure after 9/24/05

Q: How would you rate the level of information you received? Would you say it was very informative, somewhat informative, or not informative?



Measure 6: Transportation Demand Management Program

Goals and Objectives

The Transportation Demand Management (TDM) program was designed to retain and increase users of alternative modes of transportation (transit, walking, bicycling, rideshare) during the Downtown Seattle Transit Tunnel closure period. Programs are targeted towards commuters working within the Seattle Central Business District (CDB) and the International District*. A three-pronged approach was undertaken to achieve this goal:

- Enhancement of programs and products to retain existing users
- Broadening the scope of programs and products to attract new users (individuals and small employers)
- Creating a supportive operating environment necessary to promote alternative modes of transportation

** Commuters must work within the following downtown boundary to participate: south of Stewart Street, north of Dearborn Street, west of I-5, and east of Elliot Bay.*

Primary activities that occurred in the second reporting period include: targeted outreach at major commercial buildings and employers, including transportation fairs and desk drops, continued distribution of Plan Your Commute bookmarks with every downtown FlexPass delivery, implementation of a pre-tax bus purchase campaign, and continuation of the “Try Transit” promotion at the Watermark, Waterfront, and Macy’s parking garages in partnership with Republic Parking.

Data Collection

Each TDM program is being monitored and tracked to determine its attractiveness and effectiveness. The data is being collected on a month-to-month basis.

Summary

The package of TDM programs introduced in support of tunnel closure has successfully expanded participation in commute options. Some highlights include:

- Over 500 Puget Pass holders have signed up for the Home Free Guarantee (HFG) for Individuals program.
- Registration activity at Rideshare Online has increased with more than 930 registrations by downtown employees since the Downtown Seattle Transit Tunnel closure.
- The number of merchants participating in the second edition of the Shop, Dine & Ride book increased to 120.
- 54 bike riders have completed the full three-hour bicycle commute skills workshop offered by the Cascade Bicycle Club in the second reporting period.

Table 13. Second Reporting Period Data (December 2005- May 2006)

Existing Programs with Enhancements	# of New Participants (Dec 2005- May 2006)	Total (August 2005 – May 2006)
Puget Pass Consignment		
# of Accounts	2	65
# of Passes	55	4,389
FlexPass*		
# of Contracts	29^	186^^
# of Passes	883^	10,259^^
Rideshare (Carpool, Vanpool, VanShare)		
# of Accounts**	2	14
# of Users*** (riders)	21	71
Rideshare Online		
# of Registrants	430	931
Flexcar		
# of contracts****	449	682
New Programs to Increase and Retain Users of Alternative Travel Modes	# of New Participants (Dec 2005- May 2006)	Total (August 2005 – May 2006)
Home Free Guarantee (HFG) for Individuals		
# of Accounts	194	511
# of Rides (usage)	11	13
Plan Your Commute		
# of Participants	155	1,373
Telecommuting		
# of Workshops	0	0
% of companies that allow telework	22%	22%
New Programs to Support the Operating Environment of Alternative Modes	# of New Participants (Dec 2005- May 2006)	Total (August 2005 – May 2006)
Bicycling		
# of 3-hour Workshop Participants	54	77
Shop Dine & Ride		
# of Retail Participants	32	120

^ - 2006 numbers (through June 2006)

^^ - Total beginning with 2001 data

* - FlexPass and FlexPass + CT added together

** - Rideshare totals (accounts and users) from STAR Carpools, Metro Vanpools, Community Transit Vanpools, other Vanpools, and Metro VanShare. Carpools does not include City of Seattle registrations.

*** - Estimates based on 7 riders per Community Transit vanpool

**** - Both Flexcar business contracts and individual members added together

Program Notes

Puget Pass Consignment

There were two new Puget Pass consignment accounts created in the past six months. Home Free Guarantee (HFG) for consignment usage has been within the normal range based on historic trends, with fourteen rides taken during the same period.

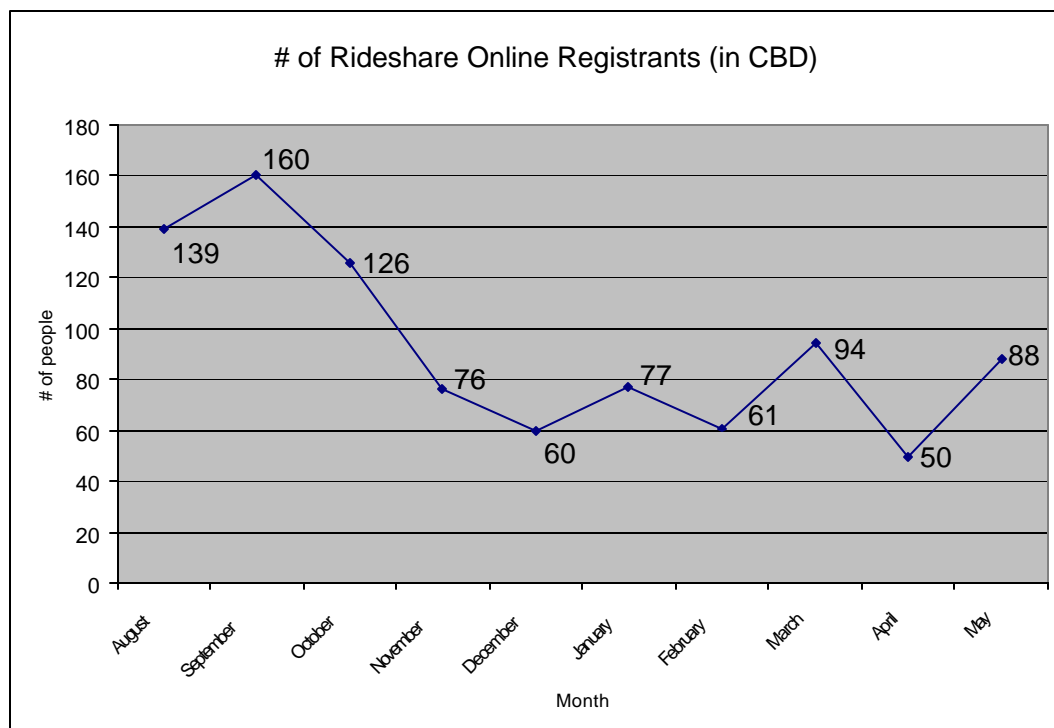
FlexPass

The number of Area FlexPass agreements that include the Community Transit (CT) option continue to increase. Currently there are a total of 36 contracts that contain the CT option, representing 19% of all downtown Area FlexPass agreements. These contracts account for 3,230 passes, or 31% of the total downtown Area FlexPasses.

Rideshare

Two new vanpools have been established since January 2006 (one Metro Transit and one Kitsap Transit). Rideshare Online has seen a significant increase in online registration since tunnel closure, with 430 new registrants in the past six months. (Chart shows all program numbers since the tunnel closure)

Figure 9. Number of Rideshare Online Registrants (in CBD)



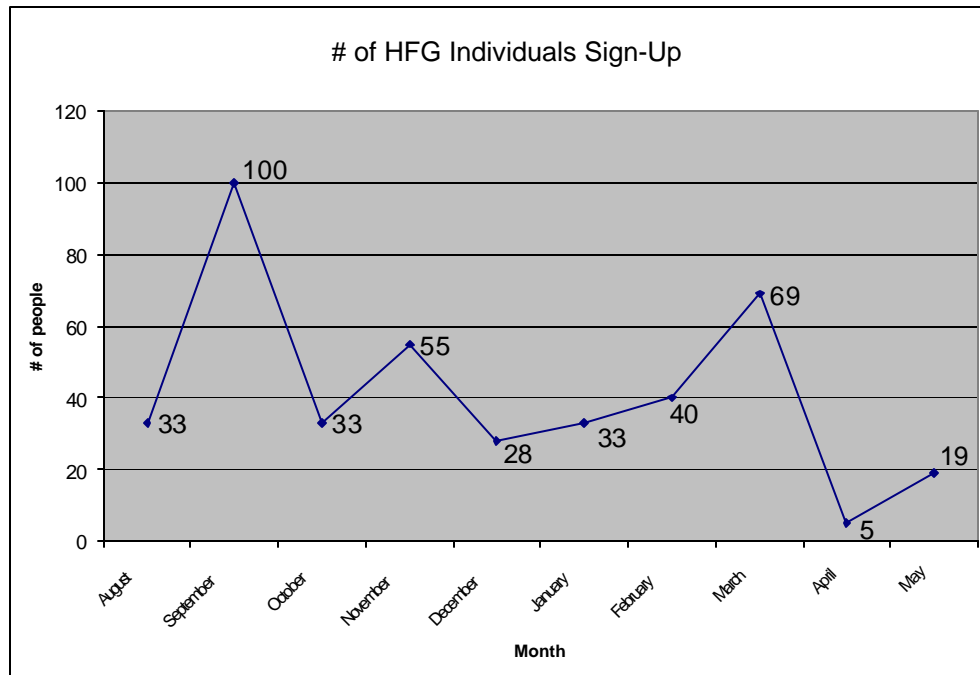
Flexcar

In the past six months, 24 new businesses and 425 individuals have joined Flexcar.

Home Free Guarantee (HFG) for Individuals

Monthly Puget Pass holders who work in downtown are eligible for Metro's HFG program at no cost. An additional 194 downtown Seattle commuters have signed up for the benefit in the past six months. Only 11 rides have been taken in that same period. (Chart shows all program numbers since the tunnel closure)

Figure 10. Number of HFG Individuals Sign-Up



Plan Your Commute (PYC)

The Plan Your Commute sessions are offered every Wednesday at the Transportation Connection, as well as at targeted transportation fairs and other events. Since December, 155 participants have learned about commute options from personal rider information officers at mobile Plan Your Commute stations since December 2005. Over 21,960 King County Metro free ride tickets have been distributed, with a redemption rate of 43%.

Bicycling

There have been a total of 54 bike commuters who work downtown that have completed the three-hour bicycle commute skills workshop in the second monitoring period. An additional 235 commuters have attended a one-hour bicycle commute information session. 21 individuals have been helped with customized bike route planning assistance. A total of over 300 individuals have been reached with information regarding bicycle commuting since the tunnel closure.

Shopper Incentives

One hundred twenty retail service providers participated in the second phase of the Shop, Dine and Ride program which encourages commuters and shoppers to continue to visit downtown Seattle throughout the tunnel closure period.

Parking

“Try Transit,” a program to encourage monthly parking garage customers to add transit to their commute options has been established at three garages managed by Republic Parking. Commute trip itineraries, free ride tickets, and other incentives have been offered to help single occupancy vehicle users to try taking the bus a few times per month. There were 15 new participants in the “Try Transit” parking program in this reporting period. A total of 31 commuters have been involved in the program since the tunnel closure.